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Maintenance of Rolling Stock on New England Railroads

By Ellsworth Sheldon

New England Editor, *American Machinist*

The first of a series of articles covering the shop practices of New England railroads—The "farthest north" railroad that lies wholly within the United States

RAILROAD traffic in New England is handled mainly by four great systems lying almost wholly within the six states. Although parts of these states are also served by branches or subsidiaries of outside corporations, the four roads entitled to the specific designation of New England railroads are, in the order of their geographical location, the Bangor & Aroostook, the Maine Central, the Boston & Maine and the New York, New Haven & Hartford.

The Bangor & Aroostook railroad bisects the State of Maine from north to south, its main lines extending from Searsport and Cape Jellison on the coast to Van Buren, Fort Kent and St. Francis on the Canadian border. Division shops are located at Cape Jellison, Northern Maine Junction, Oakfield, Houlton, Van Buren and Fort Kent. The main shops, where all of the general overhauling and rebuilding of locomotives, the building of many new freight cars, and not a little in the way of mail, express and baggage car construction is done, are at Derby, 36 miles out of Bangor. Here the road has acquired a tract of land equal in area to a small township and upon it are located the shops and offices of the maintenance department and the homes of many of the maintenance employees of the company.

Fig. 1—The drop-pit for removing wheels

Two parallel main buildings with a transfer table between them house the car and locomotive shops. The offices and drafting rooms are in a two-story building standing at right angles to the main shops, which building is also used in part as a storage room for supplies. Beyond the locomotive shop is a wood-working mill where the material for the car work is gotten out. All buildings except the office building are of single-story construction with monitor roofs.

Tracks from the yards pass through the car shops transversely, the width of the shop affording space for

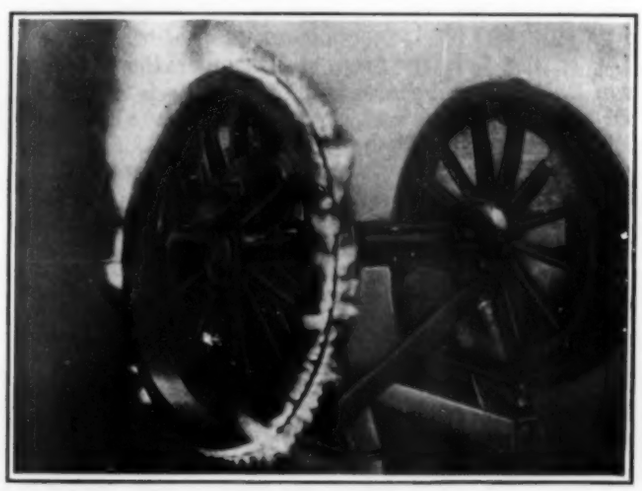


Fig. 2—Shrinking on a new tire

four cars to each track with plenty of room to work around and between them. Across the transfer table the same tracks extend into the locomotive shop where each track is provided with a pit long enough to handle the largest engine. The tracks end about midway of this building and the remaining width is devoted to the machine, blacksmith and boiler shops.

Four tracks of the car shop are separated from the remainder of the building by a fire wall, and this section is given over to the painting of passenger and

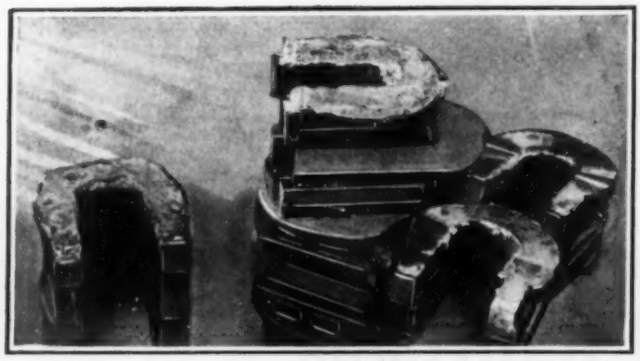


Fig. 3—Babbitt-faced driving boxes

baggage cars, locomotive tenders, cabooses and similar work. In severe winter weather the freight cars are also painted in here, but under normal weather conditions they are painted out of doors.

The runway of the transfer table extends beyond the ends of the buildings in both directions and is served by tracks that do not pass through either shop, so that a locomotive can be brought in from the yards at either side without going through the car shop. Cars to be repaired can be brought into the shop by means of the transfer table or shunted in directly from the distributing tracks on the opposite side of the building.

A locomotive coming into the shop for a general overhauling or for any minor repair that involves the removal of one or more pairs of wheels is delivered to the No. 1 track, in which there is a drop-pit. In the bottom of this pit there is a small iron truck running upon rails laid at right angles to the track-rails, and permanently mounted upon this truck is a pneumatic cylinder capable of lifting the heaviest pair of driving wheels in service on the road.

Referring to Fig. 1, to remove a pair of wheels the saddle of the hoist is brought up under the axle as shown in Fig. 1 and the weight of the wheels and axle lifted against the springs. After all the connections are removed and the driving box binders and cellars taken off, a short section of each track-rail is moved sidewise as shown at *A* and by releasing the air pressure from the cylinder the wheels are lowered into the pit. The small truck is then pushed along its track until the wheels are clear of the locomotive, when by readmitting air to the cylinder they are raised to the floor level and picked up by the overhead crane or rolled out upon the adjacent track as may be desired.

The next track, one rail of which may be seen in this illustration, leads directly to the driving wheel lathe, so that if the repair is lathe work that does not involve the removal of a tire the crane is not needed. This method of handling the wheels, taken in conjunction with the convenient location of the wheel lathe, saves much time and labor.

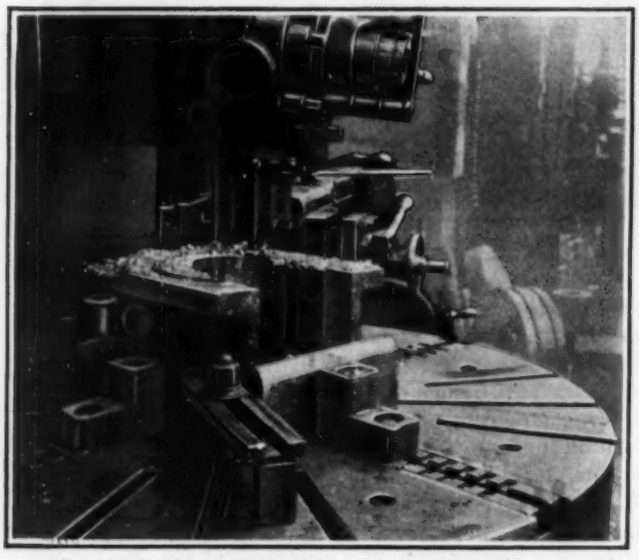


Fig. 4—Machining face of driving box

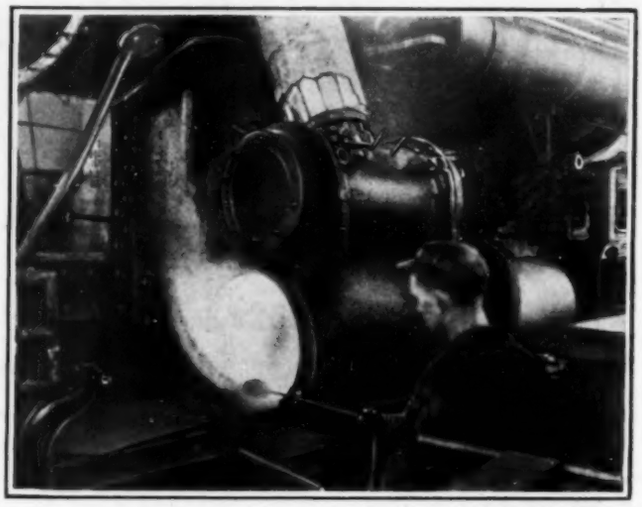


Fig. 5—Expanding a cylinder to receive a bushing

If the tires are to be removed, the wheels and axle are swung upon the horse shown in Fig. 2 by means of the crane and heat is applied to the tire by the usual form of gas-ring. The fuel used is kerosene, vaporized by air pressure supplied to the portable tank by a hose connection to the shop air mains. In applying new tires to old wheel centers a shrinkage allowance from $\frac{3}{64}$ to $\frac{1}{16}$ in. is allowed on driving wheels and from 0.020 to 0.030 in. on pony truck tires.

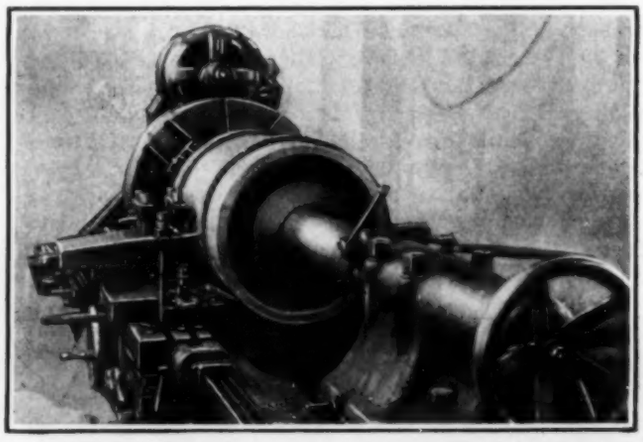


Fig. 6—Machining the reducing bushing

When the hubs of a pair of driving wheels have become worn by service they are fitted with liners of hard bronze in the following manner: The hubs are recessed to a depth of about $\frac{3}{8}$ in. over the full diameter, and the bottoms of the recesses are drilled and tapped to receive beveled-head bolts of soft iron that are

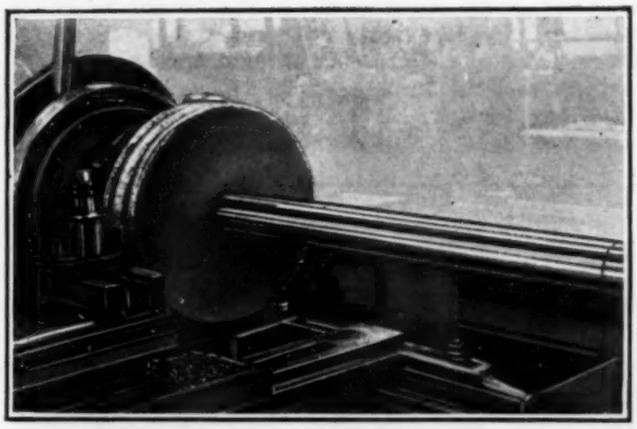


Fig. 7—Piston built up with manganese bronze

screwed tightly into place; the heads remaining about flush with the original surface of the hub. Six or eight bolts are set in each recess. Molten bronze is then poured into the recesses around the bolt-heads, which, by reason of their beveled shape, hold the bronze securely in place. The composite surface, consisting of the bronze casting and the heads of the iron bolts, is then faced off smooth in the driving wheel lathe.

The bronze casting generally cracks in several places while cooling, but no part of it can get away from the anchor bolts and when the engine goes into service the cracks fill up with grease and serve as reservoirs of lubrication.

Driving boxes are faced with babbitt to run against the relined hubs of bronze. A dovetailed circular groove is machined into the side of the driving box, anchor holes drilled in the bottom of the groove, a temporary mold of any suitable material is built up around the box and the babbitt poured in. Figs. 3 and 4 shows some of the boxes before and after machining and on the table of the boring mill in which the work of facing is done.

An experiment is being tried to determine the relation of cylinder diameter to boiler pressure that will result in the greatest economy of fuel. In Fig. 5 is shown an engine with 20-in. cylinders that are to be reduced by bushing to 18 in., and the boiler pressure raised about 15 lb. to compensate for the reduced diameter. The bushing is turned and bored in a lathe as shown in Fig. 6, the outer diameter being left 0.031 in. larger than the bore of the cylinder.

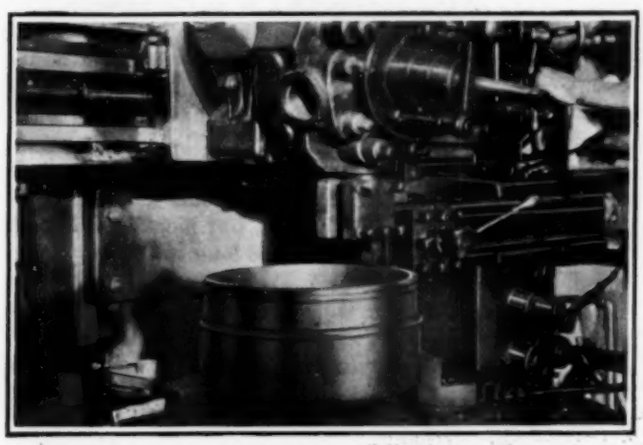


Fig. 8—Making piston rings

The heat necessary to expand the cylinder is applied by means of a torch and the portable heating outfit. The cylinder is temporarily closed at the stuffing box end by a metal plate that can be removed quickly and the bushing may be seen lying upon a cradle beyond the cylinder, ready to be drawn into place.

The success of this job depends in large measure upon the skill and judgment of the workman, for the bushing must be drawn into place very expeditiously. If it goes in at all it will go quickly and without difficulty. If there is any hesitation about it the cold bushing will absorb heat from the wall of the cylinder and expand quickly to meet it; in which case if the bushing is not exactly where it ought to be there is nothing to be done but to split it out and make another one.

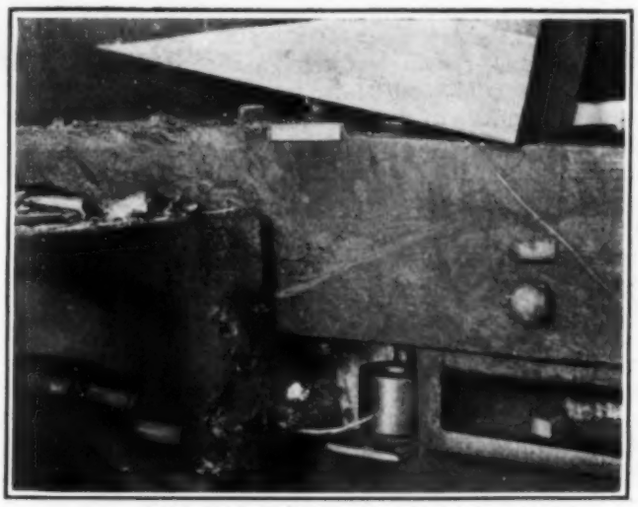


Fig. 9—The "gun" ready to shoot a bolt

Worn pistons are built up by welding on a layer of manganese bronze by means of the acetylene torch, after which the piston is redressed as in Fig. 7 to nominal size. Manganese bronze has been found especially suitable to this work, as it stands up well and does not cause excessive wear of the cylinder wall.

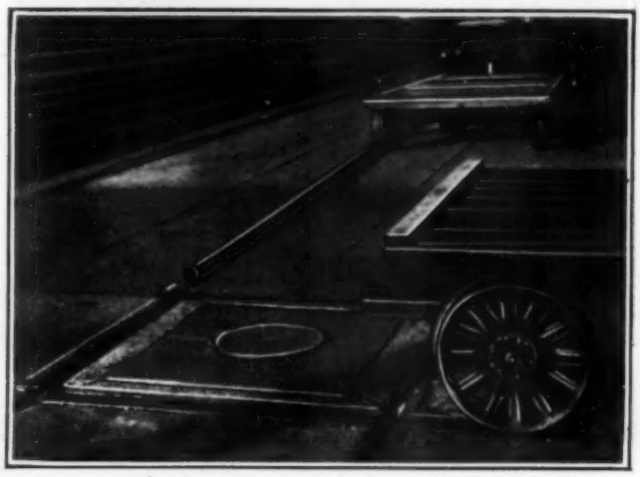


Fig. 10—Turntable for small cars

Piston rings are made upon a Bullard vertical lathe as in Fig. 8. They are made from pot castings and the bore is concentric with the outside, resulting in a ring of uniform cross-section. A shallow groove is cut

around the ring midway of its width; the theory behind this practice being that the groove will fill up with oil and assist in lubricating the cylinder.

In dismantling an engine for the purpose of replacing the cylinder-blocks and saddle it becomes necessary to remove many of the bolts from the frame. Not only are these bolts fitted tightly in the first place, but long exposure to weather has not made them any easier to remove, nor is their location conducive to the use of a sledge to drive them out. In some cases it is necessary to resort to the expedient of "shooting" them out.

The "gun," shown ready for a shot in Fig. 9, is a bushing of mild steel 3½ in. in diameter by about the same in length, with a tightly fitting shouldered plug driven into one end of the ⅞-in. bore. The "bullet" is a steel plug that fits the bore closely but not tightly, and rests upon the charge of smokeless powder. The head of the shouldered plug at the lower end of the bushing rests upon one member of the frame while the bullet is wedged tightly under the exposed end of the bolt to be removed.

The charge is fired by a fuse in the vent-hole of the gun. There is not sufficient room between the frame members to allow the bullet to get out of the gun, even supposing that the bolt was blown clear, so that there is little danger of shooting anything except the bolt. A block of wood is laid over the head of the bolt so that it will not fly, even if it does come out, and a couple of heavy planks are leaned against the frame in front of the gun as an additional safeguard.

The man in charge of the job then lights the fuse and the gang retires to a respectful distance to await results. They do not have to wait long, and the results are usually quite satisfactory. An obstinate bolt may require two or more shots to make it loosen up, but usually it is blown far enough the first time so that it can be pried out of the frame with a pinch-bar.

The place where the gun is shown in Fig. 9 is especially convenient for its use, but there are other places

Fig. 11—The car on the turntable

in the frame where the same method of removing bolts may be used to advantage by placing suitable blocking under the gun. There is little or no danger attendant upon the operation, and as a time saver over drilling out a refractory bolt it is invaluable.

Its principal disadvantage is the effect of the sudden detonation upon the nerves of people near by who have not been duly apprised, and to counteract this the shooter is required to blow an air whistle as a warning signal before applying the match.

Discarded air-brake cylinders and pistons are used to advantage in several ways. In Fig. 10 may be seen a standard gage track extending along the side of the locomotive shop and crossing at right angles the tracks leading from the transfer table. In each intersection the reader will observe a round plate of metal. This plate is mounted by a ball thrust bearing upon the end

Fig. 12—The wood-breaking machine

of the piston rod of an air-brake cylinder that is sunk in the concrete at the intersection. A pressure and release valve located just inside the adjacent doorway controls the action of the piston.

The small push cars to be seen in Figs. 10 and 11 are used to transport material from the mill or storehouses to the locomotive and car shops, and at each track intersection where it is necessary to shift the car from one track to the other there is one of these improvised hoists. Instead of unloading and reloading a car, or calling a gang of men to lift it from one track and deposit it on the other, the car is run over the intersection and air admitted to the cylinder to raise the car from the track as in Fig. 11; when it may be swung around with ease and lowered to the other track. One man is thus able to deliver a load at any desired point of the shops without assistance.

Another application of a discarded air-brake cylinder is to a machine called a "wood-breaker," located alongside the rip-tracks in the yard. The frame of the machine, shown in Fig. 12, is made of heavy timbers set upon posts that are sunk in the ground, and is floored over. The cylinder rests in a horizontal position upon the floor and is securely bolted to the timbers of the frame. On the end of the piston rod is an "axe," made from pieces of boiler plate with a triangular shaped piece of tool steel welded in at the apex.

Stout posts located at suitable places about the frame project a few inches above the floor. A plank fence in which there is an open panel covered by a heavy wire netting protects the operator from flying splinters without preventing him from seeing what is going on.

Scrap wood from the demolished freight cars is sent to the various round-houses of the road to be used as kindling in firing up cold engines, but most of the stuff coming from the freight cars is too long to go into a firebox and therefore has to be broken up. The car wreckers have only to throw the pieces on the floor of the machine as they strip them from the car and the operator does the rest by manipulating the air valve. The machine will smash anything up to a 3x4, and will do it as fast as the gang can throw the stuff on the floor and clear away the wreckage.

Specifying Material for Screw Machine Products

By Sydney Fisher
Research Engineer, the Bridgeport Brass Co.

Comparative costs of steel and brass—Scrap versus machine time—Formulas and curves for calculation—Actual examples compared

IN AN article entitled "Reducing Screw Machine Product Costs by Substituting Brass for Steel," on page 823, Vol. 58, of the *American Machinist*, Harold L. Burlingame, of the Brown & Sharpe Co., presents some interesting cost comparisons in tabular form. This tabulation, a copy of which is given in Fig. 1 for reference, is indeed illuminating.

Brass is usually valued for its non-corrosive property, its color, and the ease with which it will take a fine finish and nickel plate. Its relatively high metal cost, however, limits its use in the mind of the average individual, who is usually not aware of the fact that relatively high scrap value and superior machining quality in many instances more than offset the high initial cost and make brass more desirable than steel. Mr. Burlingame demonstrates this for a fairly wide range of products. Considered from the broad economic standpoint the overall cost of brass should be carefully balanced against that of steel, in all cases where tensile strength and magnetic property are not determining factors. Brass for the accomplishment of the same purpose, requires but a fraction of the screw machine capacity that steel requires, while its non-corrosive property may in many instances prove exceedingly valuable.

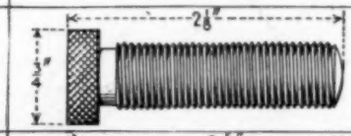
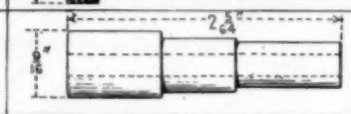
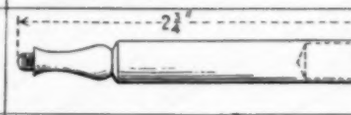
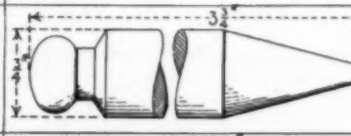
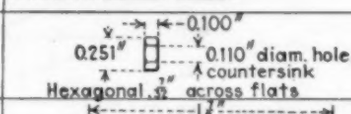
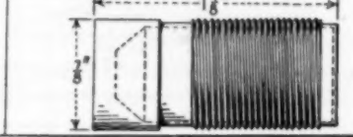
Fig	Samples	Stock	Pieces per Hour	COST EACH: Mach. Time	Man Time	Stock	Total	Per Cent	Mach. Prod.
1		Brass	115	0.0087	0.0022	0.0434	0.0543	100	4.3
		Steel	27	0.0374	0.0078	0.0141	0.0593	109	1
2		Brass	105	0.0095	0.0024	0.0242	0.0361	100	7
		Steel	15	0.0667	0.0167	0.0079	0.0913	250	1
3		Brass	160	0.0063	0.0016	0.0078	0.0157	100	2.2
		Steel	115	0.0087	0.0022	0.0025	0.0209	134	1
			200	0.005	0.0025				
4		Brass	200	0.005	0.0013	0.074	0.0803	100	4.5
		Steel	45	0.0225	0.0056	0.0243	0.0524	65	1
5		Brass	4468	0.00022	0.00005	0.00036	0.00064	100	5.6
		Steel	800	0.00125	0.00031	0.00012	0.00168	263	1
6		Brass	270	0.0037	0.0009	0.0525	0.0571	100	10
		Steel	27	0.037	0.0093	0.0170	0.0633	111	1

Fig. 1—Comparative costs of and data on brass and steel screw-machine products

In making a cost comparison, the extra metal cost of brass is balanced against the extra machining cost of steel. Usually, the gross weight per piece, the scrap weight per piece, and the machine output for steel are known. The problem then resolves itself into the determination of that ratio of brass to steel output which will make the saving in brass machining cost equal to, or greater than, the extra metal cost of brass.

To facilitate the solution of this problem the writer presents two simple relations, by means of which the extra metal cost of brass, and the extra machining cost of steel can be readily determined for any piece, and the comparison easily made. An important consideration in making these comparisons is the difference in density of brass and steel. For the same volume, brass is 1.08 (approx.) times the weight of steel, hence steel product weighing 1,000 lb. would weigh 1,080 lb., if made of brass. The cost relations discussed below are based on the following quantities:

Cost of cold rolled steel rods,	$0.044	per lb.
Cost of brass rods,	$0.15	per lb.
Value of steel turnings,	$0.005	per lb.
Value of brass turnings,	$0.0825	per lb.

The above are published market prices (Aug. 20.

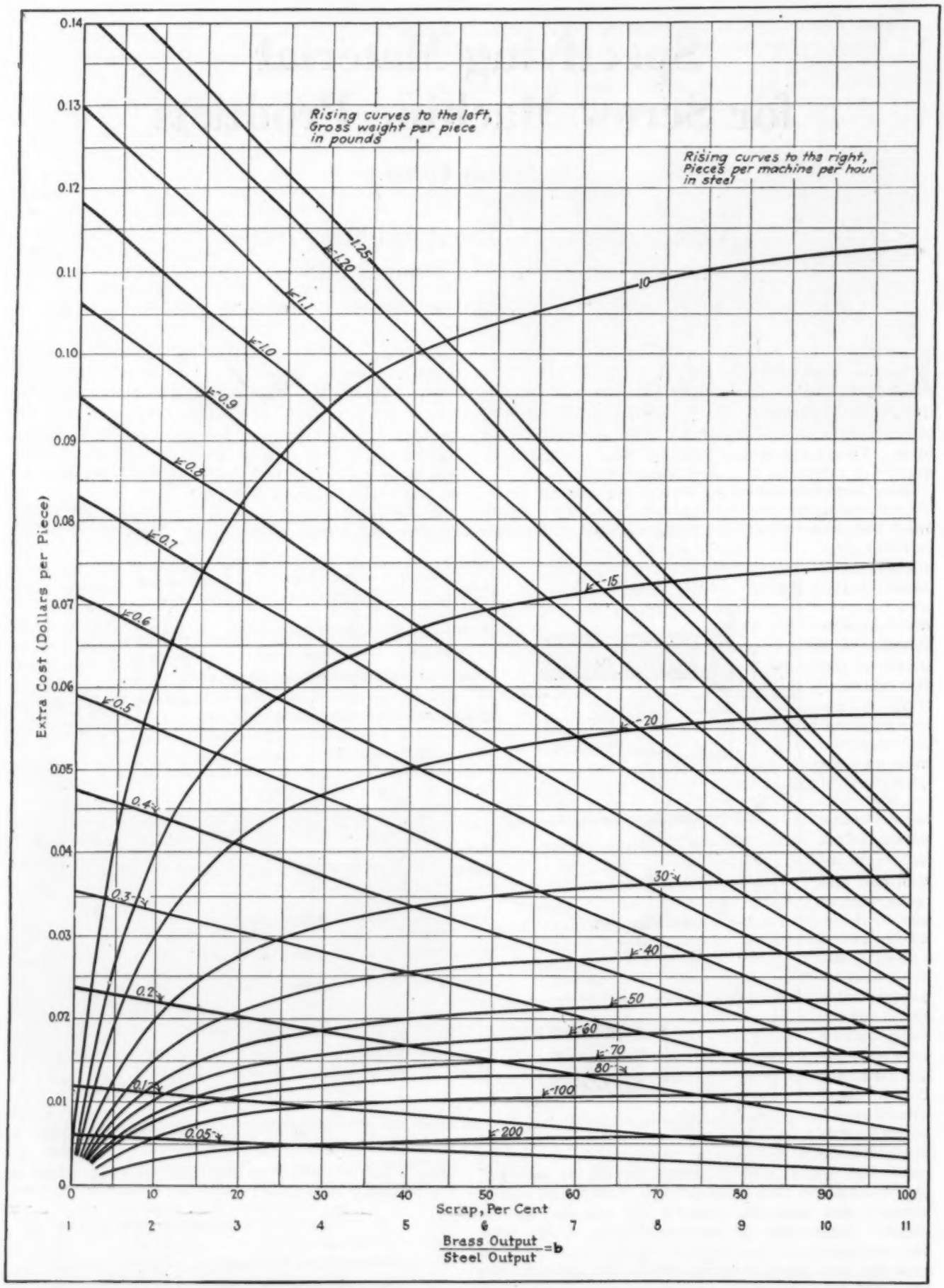


Fig. 2—Curves for comparative calculation

1924) for ⅞-in. round rod. For rods under ⅞ in. these prices are increased by extras, which cover the cost of extra processing. Steel extras are a higher percentage of the base price than brass extras, however, hence comparisons favorable to brass for sizes above ⅞ in. would be still more favorable for sizes under ⅞ in.

Weight per cu.ft. of steel,	474 to 494 lb.
Weight per cu.ft. of brass,	510 to 542 lb.
Ratio of densities, brass to steel,	1.075 to 1.095
Value taken,	1.080
Labor cost per machine per hr.	$0.25
Overhead cost per machine per hr.	$1.00

These are Mr. Burlingame's labor and overhead figures. Considering his connection with one of the largest manufacturers of screw machines, it would seem that these figures are an authoritative average and therefore safe to use.

As used in the relations below, the figures apply to operating time only, not to set-up time, because the set-up time for brass should certainly not be greater than that for steel. Hence it is not a factor in the problem. On a large job the total set-up time might be less for brass than for steel, because of the reduced wear and tear on tools.

Due to increased output, a machine operating on brass would require more attendance than one operating on steel, and hence the labor cost per machine per hour would be greater. In this discussion the writer assumes that the labor payroll of the shop is not increased by the partial use of brass and the necessity of hiring more help has been obviated by applying the principles of good foremanship.

W_s = gross weight of steel per piece,
S_s = scrap weight of steel per piece,
$A = \frac{S_s \times 100}{W_s}$ = per cent scrap
$1.08\ W_s$ = gross weight of brass per piece,
$1.08\ S_s$ = scrap weight of brass per piece,
N_s = output in steel pieces per hr., per machine,
N_b = output in brass pieces per hr., per machine.

Metal cost of steel per piece = $(W_s\ 0.044) - (S_s\ 0.005)$.

Metal cost of brass per piece = $[(1.08\ W_s)0.15] - [(1.08\ S_s)0.0825]$.

Extra metal cost of brass per piece = $[(1.08\ W_s)0.15] - [(1.08\ S_s)\ 0.0825] - [(W_s\ 0.044) - (S_s\ 0.005)] = 0.1180\ W_s - 0.0841\ S_s = 0.1180\ W_s - 0.0841\ AW_s = W_s(0.1180 - 0.0841\ A)$.

For a given gross weight per piece, W_s, for instance 1.0 lb., 0.9 lb., etc., the extra metal cost of brass varies with the scrap per cent A. This variation is represented by the straight lines on the graph sheet Fig. 2. The horizontal scale is used for scrap per cent and the vertical scale for extra metal cost of brass.

If the gross weight per piece for steel were 0.4 lb. and the scrap 30 per cent, the extra metal cost of brass would be 3.7c. per piece. If the scrap were 70 per cent the extra metal cost would be 2.36c. Extra costs for gross weights between those for which the graphs are drawn may be determined by interpolation. For instance, with gross weight per piece 0.35 lb., scrap 30 per cent, extra metal cost of brass 3.25c., gross weight per piece 0.525 lb., scrap 50 per cent, and extra metal cost 4.0c., then

Labor and overhead cost per piece for steel $= \frac{\$1.25}{N_s}$

Labor and overhead cost per piece for brass $= \frac{\$1.25}{N_b} = \frac{\$1.25}{bN_s}$

Extra cost to machine steel $= \frac{\$1.25}{N_s} - \frac{\$1.25}{bN_s} = \frac{\$1.25}{N_s}\left(1 - \frac{1}{b}\right)$

For a given machine output for steel N_s, for instance 20 pieces per hr., the extra cost to machine steel varies inversely as b, the ratio of brass output to steel output. This variation is shown by the logarithmic curves on the graph sheet, Fig. 2. The horizontal scale is used for the output ratio b, and the vertical scale, as above, for extra cost, in this case of machining steel. The two sets of curves are plotted on the same sheet to facilitate comparison.

If the output of steel is 40 pieces per machine per hr., and the output of brass is five times as great, or 200 pieces per hr., the extra cost of machining steel would

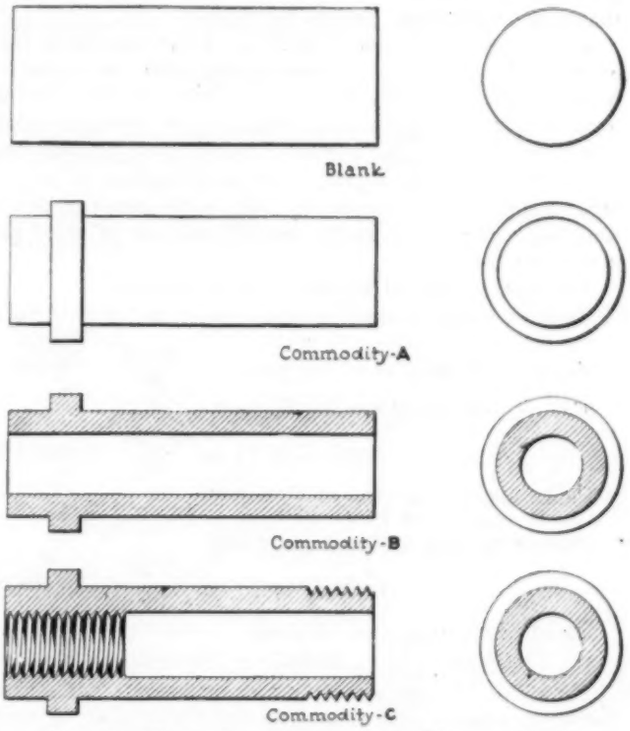


Fig. 3—Examples of screw machine products

be 5c. per piece. If the output ratio were 3, the extra cost of machining steel would be 4.16c. per piece. Pieces, the gross weight of which is less than 0.05 lb. and the machine outputs correspondingly large, should be considered in batches of 25, 50, and 100, or more, so as to facilitate comparison and avoid errors due to difficulty in correctly reading the lower scales.

Typical problems will illustrate the use of these curves in finding the required machine output for brass so that overall cost of brass will equal that of steel.

Gross weight per piece in steel = 0.275 lb.
Scrap = 45 per cent.
Output in steel per hour = 40 pieces.
Extra metal cost of brass = 2.2c.

A horizontal line through 0.022 intersects the 40 pieces per machine per hr. curve at ratio 3.3, hence:

Brass output for equal cost = 3.3 × 40 = 132 pcs.

Outputs greater than 132 pieces per machine per hour would realize a profit.

Gross weight per piece in steel = 0.0034 lb.
Gross weight per 100 pieces = 0.34 lb.
Scrap = 10 per cent.
Output, steel pieces per hour, = 1,000 = 10 × 100.
Extra metal cost of brass per 100 pieces = 3.7c.

The horizontal line through 0.037 intersects the 10 per machine per hour output curve at ratio 1.42, hence:

Brass output for equal cost, = 1.42 × 1,000 = 1,420 pieces.

For larger outputs a substantial overall cost reduction is realized by the use of brass.

Some very interesting conclusions may be drawn from a study of these curves, a knowledge of which should better enable one to recognize the desirability of substituting brass for steel under certain conditions.

For a given gross weight per piece, the extra metal cost of brass decreases as the scrap per cent increases.

This decrease in extra metal cost of brass with scrap per cent is greater for large gross weight per piece than for small gross weight per piece.

For a given machine output per hour the extra cost of machining steel per piece varies with the ratio of brass output to steel output, b. This variation being logarithmic, the extra machining cost of steel per piece over that of brass, for a given steel output per machine per hour, increases rapidly for small values of b and less rapidly as b increases. It finally approaches a limiting value which is the machining cost of steel per piece, for instance,

Machine output, steel per hour = 20 pcs.
Ratio of brass to steel output = 5 to 1 and 10 to 1

$$\text{Machining cost of steel per piece} = \frac{\$1.25}{20} = \$0.0625$$

Machining cost of brass per piece

$$(\text{ratio 5 to 1}) = \frac{\$1.25}{100} = \$0.0125$$

Extra machining cost of steel per piece (ratio 5 to 1) = \$0.0625 — \$0.0125 = \$0.50

Machining cost of brass per piece

$$(\text{ratio 10 to 1}) = \frac{\$1.25}{200} = \$0.00625$$

Extra machining cost of steel
(ratio 10 to 1) = \$0.0625 — \$0.00625 = \$0.05625

Thus the saving accomplished by the use of brass, due to increasing the output to five times that of steel, is eight times the saving realized by raising the output, from five to ten times that of steel.

This is significant, in that it indicates that the major portion of the possible saving in machining cost, due to the use of brass, and, therefore the possibility of offsetting the extra metal cost of brass is realized with relatively small output ratios, 2, 3, 4, etc.

As the machine output for steel decreases, the variation in extra machining cost of steel per piece increases rapidly with the output ratio b.

Since the extra metal cost of brass decreases as the scrap per cent increases and as the machining time, and therefore extra machining cost of steel, bears a more or less direct relation to the scrap or metal displaced per piece, the relation is not direct when operations are performed simultaneously or when the operations are relatively difficult, as for instance threading, etc. Pieces requiring relatively large gross weights to the machine and small net weights from the machine, could probably be produced cheaper if made of brass than of steel.

The extra metal cost of a given weight of brass, which produces a given net weight of product with a given scrap per cent, is independent of the number of pieces produced. The extra metal cost per piece will depend on the number of pieces. The more finely divided the given weight of brass the less significant will be the extra metal cost per piece. Now while machine output and, therefore, machining cost is more or less commensurate with the size of piece, there are many instances where difficulty of machining reduces the output of small pieces, in which case cost of machining may be greater than metal cost. Hence brass will realize a very appreciable saving over steel, when used for light weight pieces of complex shape.

Consider three automatic machine products, each requiring the same initial shape and volume of metal, whether it be brass or steel. Which of the three could be made cheaper of brass than of steel?

A—The scrap per cent and the amount of machining are small. Hence the value of the brass scrap would not appreciably offset high initial metal cost, and the saving in machining cost due to the use of brass would be small. This piece should be made of steel.

B—The scrap per cent is large and machining is considerable. The value of the brass scrap would appreciably offset the initial metal cost and reduce the overall metal cost to a point where, together with the saving in machining, brass would be more desirable than steel.

C—The scrap per cent is large, and the machining considerable, and relatively difficult. The same results will follow as in B. In addition, by using brass a further saving in machining cost and therefore overall cost would be realized, due to the greater ease of threading and roll-threading brass.

What Is a Used Machine Tool Worth?—Discussion

By Martin H. Ball

The worth of a used machine tool was discussed in an editorial under the title given above on page 670, Vol. 61 of the *American Machinist*. The real value is an unusually hard matter to determine for both buyer and seller. It would seem that a percentage value based on the current market price might be established as a basis, as recommended in the editorial and I would suggest the percentages in the accompanying table be used.

Taking for illustration, a machine of \$1,000 current market price, its worth would be as follows:

Table—Depreciation of a \$1,000 Machine Tool

	Current Value		Depreciation for the Year
Years	Percentage	Dollars	Dollars,
1	80	800	200
2	63.7	627	173
3	48.2	482	145
4	36.2	362	120
5	26.7	267	95
6	19.2	192	75
7	13.5	135	57
8	9.3	93	42
9	6.2	62	31
10	4.1	41	21

Automotive Production

Principles Underlying Some Automobile Jigs

By K. Edwin M. Karlson
Factory Manager, The Cleveland Automobile Company

Box girder section bases—Disappearing dowels—Quick-acting cam clamps—A single-blade reamer for piston-pin bushings—Various types of jigs and fixtures—Truing bell housings

THE Cleveland Automobile Co. manufactures its own engines, transmissions, axles and other units, and throughout the various processes has endeavored to preserve a unity of purpose behind which lies an adherence to certain fundamental principles. This is most noticeable in the engine unit, and in some of the jigs and fixtures used for its manufacture. The influence of the machine-tool industry is readily apparent and is due to the work of the chief tool engineer, J. Gustaf Moohl, who spent many years in engineering work for such firms as the Ingersoll Milling Machine Co., Beaman & Smith and the Cleveland Milling Machine Company.

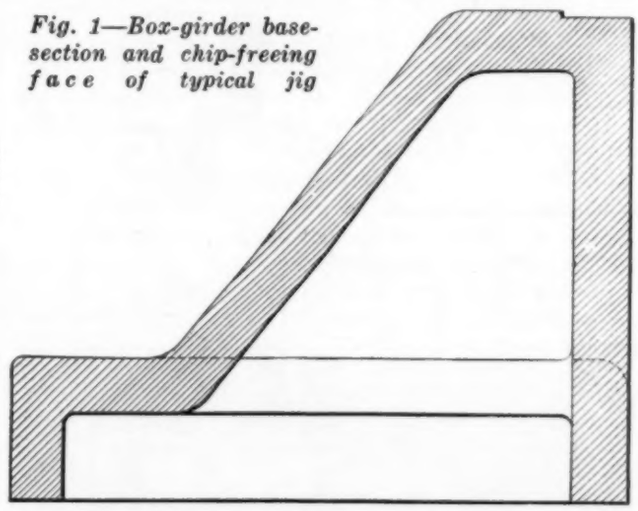


Fig. 1—Box-girder base-section and chip-freeing face of typical jig

His jigs and fixtures are noticeably heavy and rigid, largely to prevent vibration while heavy cuts are being taken, and also to minimize inaccuracies set up by warpage due to internal or external stresses. Bases are not of the usual "bolt-diameter" thickness but are generally of box girder section similar to surface plates, Fig. 1. The same base is often used throughout a sequence of jigs, the superstructure alone being changed, thus effecting considerable economy in design and pattern work as well as accustoming the men to the use of similar types. The top surface is inclined so that chips will fall away readily from the operator. Long bolt holes are used, and in order to minimize the

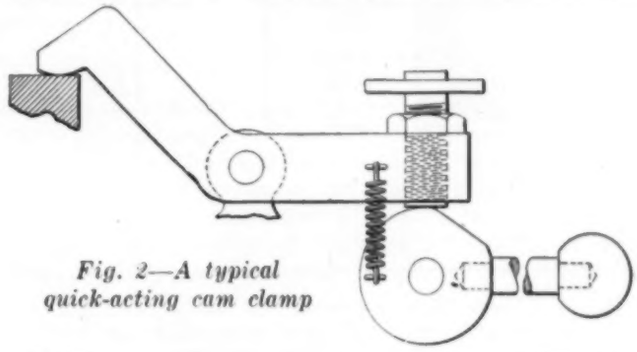


Fig. 2—A typical quick-acting cam clamp

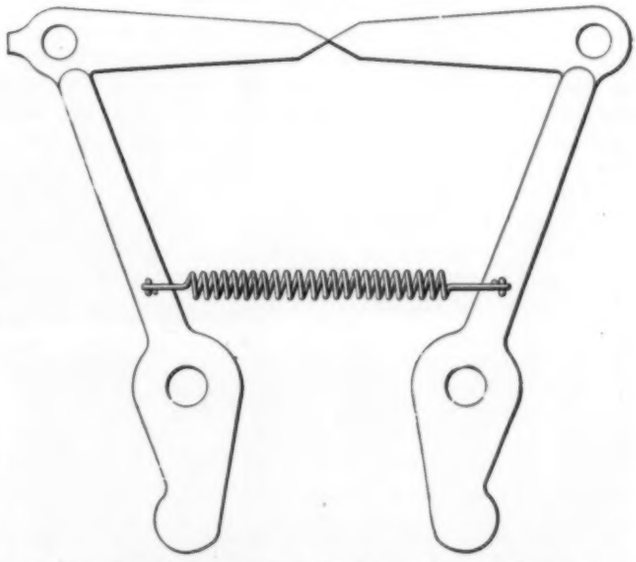


Fig. 3—Diagram of indicators for evening up thicknesses of casting walls

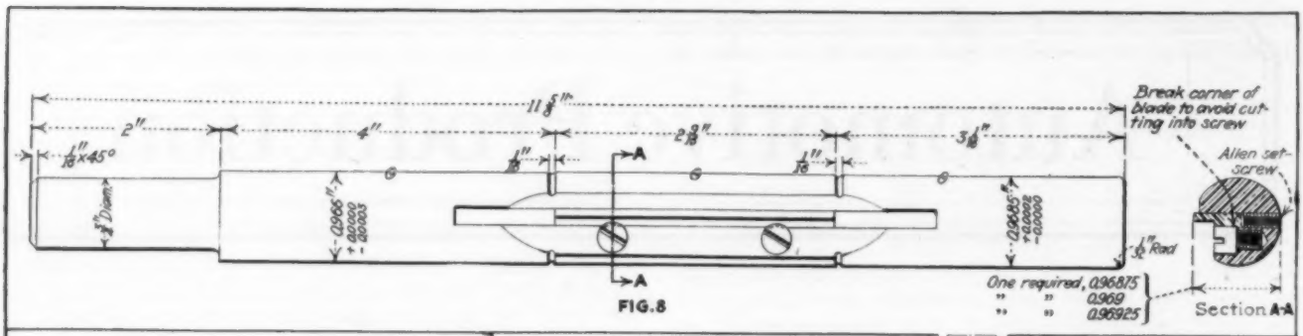


FIG. 8

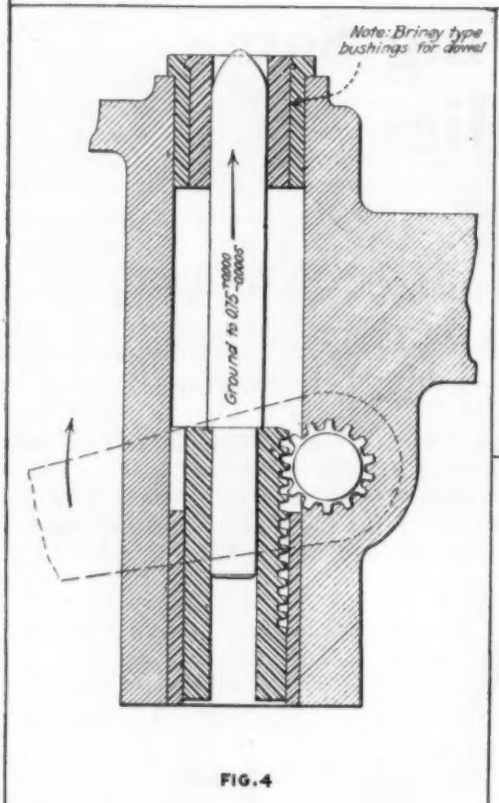


FIG. 4

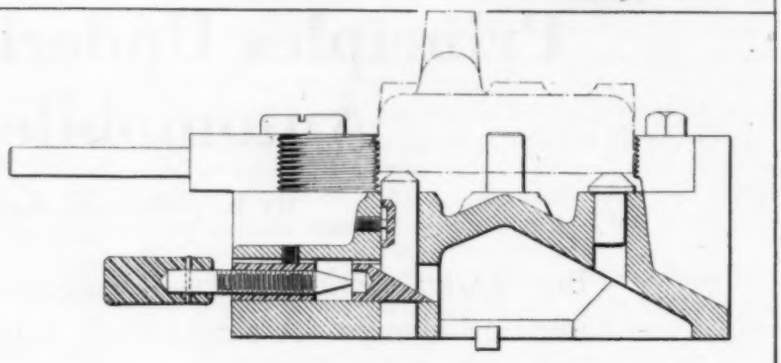


FIG. 5

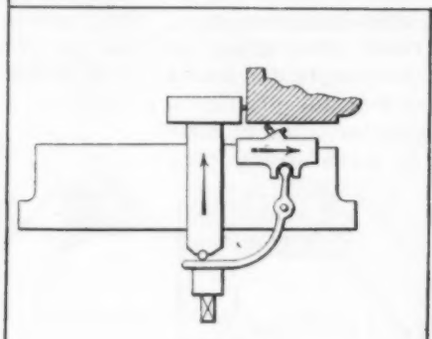
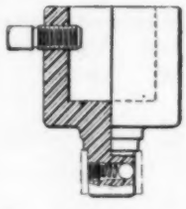


FIG. 10a



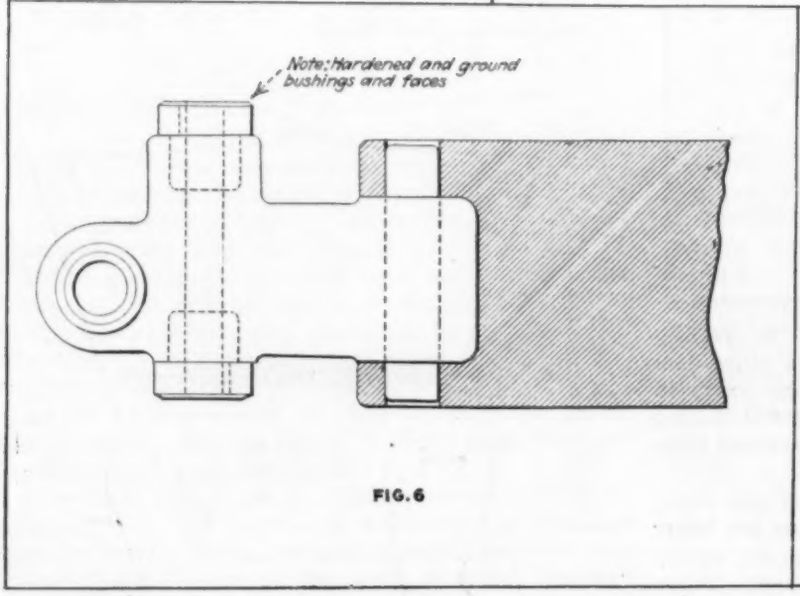


FIG. 6

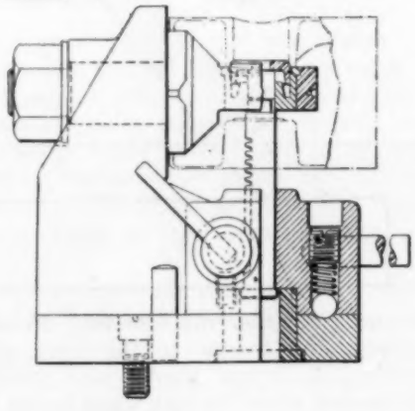


FIG. 7

Fig. 4—Design of disappearing dowel. Fig. 5—A wedge-actuated push pin and a solid one. Fig. 6—A swinging support. Fig. 7—Fixture for pressing in piston-pin bushings. Fig. 8—A single-blade reamer. Fig. 10a—Diagram of principle of tool shown in Fig. 10

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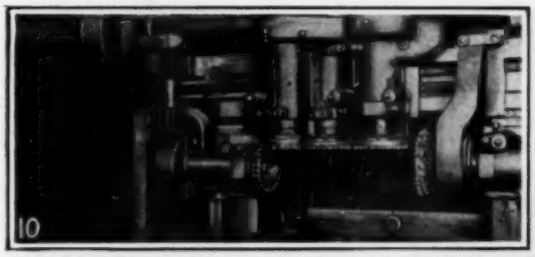
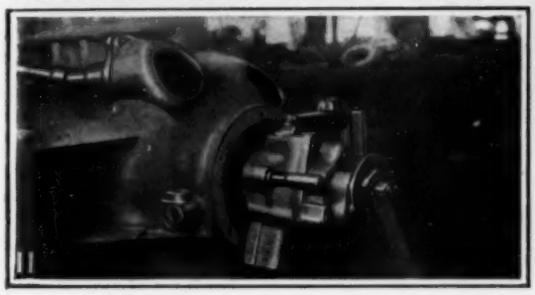
number of wrenches needed, as well as provide ample strength and effect various economies, a $\frac{7}{8}$-in. bolt is the standard as far as possible. All bolts and nuts for clamping the work on milling fixtures are $\frac{1}{4}$-in. U.S.S., so that the operator need only have one wrench in use.

Cam clamps are used on practically all drilling jigs but are not thought rigid enough for milling-machine use owing to the vibration. One is shown in Fig. 2.





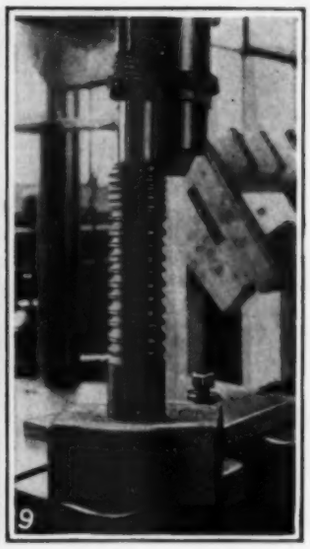


Fig. 9—Combined broach and burnisher for connecting-rod ends. Fig. 10—Tool for truing up the bell housing bore and face. Fig. 11—Milling cutter set-up for cylinder blocks

Briney removable steel bushings are used in drilling jigs and for dowel guidance. These are of casehardened steel with an upper flange dovetailing in the course of a revolution into a similar flange on an outer bushing fitting in the main body of the jig. The inner bushing is standardized as regards its outer diameter and the outer one has an allowance for fitting into the jig. This system has the great advantage of having the inner bushings rapidly replaceable and also allows of a reasonable stocking up of spares for emergencies.

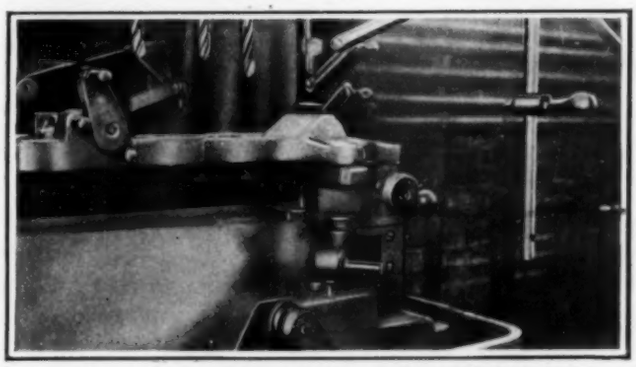


Fig. 12—Example of drill jig for cylinder head

The usual method of locating is to take two holes already existent in the design, but quite often two special holes are added whose sole purpose is to act as locating members. In a few cases where planes some distance apart are to be worked on, supplementary locating holes are used temporarily during a particular operation. These locating holes are first established in relation to the general dimensions of the pieces, and once established, follow the work throughout to prevent cumulative errors creeping in. One target jig used in the cylinder blocks has two fingers pressing outwardly in the jackets of the center cylinders, 3 and 4, and connected through a series of levers to a pair of recording pointers which give visual evidence of the work being central. A magnification of 12 to 1 is found necessary, as indicated by the sketch shown in Fig. 3.

Disappearing dowels play a prominent part in locating. They are first set flush with the surfaces of the supporting bosses and the casting is slid into place. A lever is then pulled over and acting through a rack and pinion pushes the dowel into the locating hole, as in Fig. 4. The position of the levers is such that they interfere with the placing of the part in position unless the dowels are flush, thus preventing maladjustment and damage. Rapid loading and unloading is possible, a test of a group of engine jigs showing an average loading time of 12 seconds each.

Locating spots or faces in addition to the holes are also decided on by the tool engineer, and are often placed to act as foundry checks. The principle of three-point support is used and parts rest on three selected spots. Push pins as in Fig. 5 are then raised into position and located so as to give additional support without strain to the other surfaces. A support is provided under every drill as far as possible, and, in adition, swinging supports are sometimes used between the jig and the work as shown in Fig. 6.

One clever little fixture, as shown in Fig. 7, is used in pressing in the piston-pin bushing into the pistons. A Greenerd arbor press is used with the upper part of the fixture attached to the ram. The spring-actuated ball locates the oil hole accurately on the bushing, which slips on over the end. The piston is placed with the inside face of a boss on the angle projection, and located by the sliding dowel which fits in the bushing hole. As the bushing comes down it drives back this dowel to a stop which gives the proper position.

It is also interesting to note that in reaming these bushes in place a single-blade reamer as shown in Fig. 8 is used. This leaves a smooth accurate surface.

Another tool worth mentioning is that for recessing

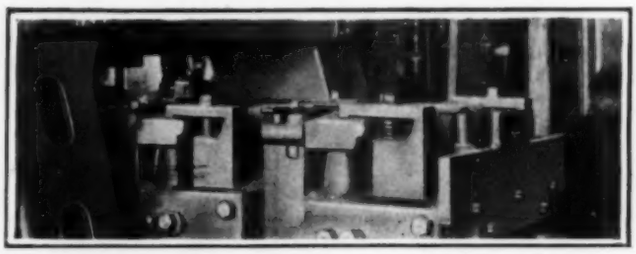


Fig. 13—Milling jig for cylinder head

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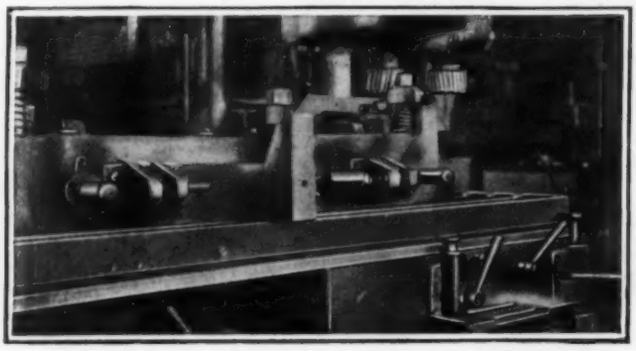

Fig. 14—Milling fixture for cylinder blocks

the babbitt on the bronze bearing caps in the crankcase. It consists of an end mill driven through flexible shafting, and fastened to a plate whose face is surfaced. The nose carrying the cutter spindle is a definite size and when the plate rests on top of a plate jig located on the crankcase lower pan face, this nose engages with a curved slot. When the mechanic pushes the plate along this slot the milling cutter recesses the proper clearance from the surface edge of the babbitt.

Yet another special tool is made from a Garvin milling machine in which the central table is replaced by a fixture to hold a connecting rod. The two heads of the machine carry respectively roughing and finishing tools for boring and finish reaming the big end bushing. This bushing is finished by the combined broach and burnisher shown in Fig. 9.

The bell housing is trued with the crankshaft by a tool which also bores the ring hole for the transmission case, Fig. 10. It will be noted that the tool is fastened to the flywheel which is driven by a pinion in the self-starter location. The arm on the right-hand side rests on the floor and furnishes the feed. The knurled pin shown fitted along the center of the tool has a slow taper and is used as an indicator gage to tell when the ring hole is accurately sized. See also Fig. 10a.

The line up of the cutters for the cylinder blocks on the Ingersoll milling machine is given in Fig. 11. These are approximately 9½ in. diameter and are driven at 24 r.p.m. on the roughing side. Carpenter high-speed steel is used. The driving gears are reversed on the finishing side and the speed increased to 48 r.p.m. for the Stellite cutters used. This gives a much smoother surface than usual.

In Fig. 12 is shown a drilling jig for the cylinder heads with the swinging steadyrest in the foreground just above a lever for actuating a disappearing dowel. Figs. 13 and 14 show typical jig installations and give an idea of the ruggedness of the jigs.

Motor Shop Problems

Crankshafts for 8-in-Line Motors

BY FRANK C. HUDSON

The increase in the eight-in-line epidemic makes the problems of the motor production man more difficult in many ways. Of course the cylinders are, as a rule, smaller in diameter, but when you stretch out eight holes in line instead of six, you increase your machining difficulties in several ways. Unless the cylinders are made in two blocks of four, they are harder to handle, have more chances for overchanging tables of machines and have other troubles. For one thing, it is more difficult to maintain eight boring bars or reamers to uniform size than it is six.

The crankshaft, too, presents added difficulties for both the designer and the shop man. The length requires different machines for many operations, there is more chance to spring an eight-throw crankshaft in machining, and the question of torsion also assumes even greater proportions. And after what some of my engineering friends tell me about torsional distortion, it gives me a shaky feeling every time I ride in a high-powered car. I can seem to see that crankshaft giving a good imitation of a corkscrew and it makes me nervous.

One of my good engineering friends made some tests on Liberty engines some months ago and assures me that there are times when the torsional stresses twist the crankshaft 18 deg. between the first and last crankpin. It doesn't seem possible and I've tried to get him to admit he was mistaken, but to no avail. If any crankshaft—Liberty or otherwise—can twist 18 deg. and not break, we have got some real steel to stand that punishment hour after hour. But think what it must do to the timing of the different cylinders and what a stress it puts on the whole motor. And the Liberty has only a six-throw crankshaft.

Of course no automobile engines get the punishment the aviation engine receives, except perhaps in racing cars. But they get enough, and after realizing what distortion means in a six-cylinder crankshaft it makes us wonder what is happening to the eight-throw shafts.

There are apparently two schools of crankshaft engineers, one that uses a light crankshaft and a bearing between each two throws; and the other that believes in a heavy crankshaft with fewer bearings. One contends that the many bearings hold the crankshaft rigidly; the other holds that the shaft weaves, frequently carrying the whole crankcase with it.

Heavy webs, or cheeks, between throws, stiffen the shaft against bending but hardly prevent torsion, perhaps nothing but larger main bearings can do that in any case. But they all present problems in machining, and in balancing. And, while a heavy web makes a stiffer shaft, it might easily throw the shaft out of balance and cause more distortion than it eradicated, which makes all the more necessary giving very careful attention to balancing, if not to machining.

Even the lower-priced cars are paying more attention to balancing than ever before. Machining all over seems to help, making it easier to secure the balanced, sweet-running crankshaft that all are desirous of securing for their cars.

Methods of Machine Tool Design

By A. L. De Leeuw
Consulting Editor, *American Machinist*

The gib in its simplest form—Advantages of taper gib—Materials to use for gibs—Types of gibs that should not be used

GIBS or shoes are filling pieces between a slide and its supporting member. They are made in various types and serve various purposes. One purpose is to make it unnecessary to fit the slide to its support. Another is to provide means for adjustment when wear takes place. Still another is to provide means for varying the tightness of the fit under varying conditions of load or temperature.

One of the simplest forms of gibs is shown in Fig. 273-a. This gib is merely a strip of metal partly filling the gap left between the slide and its support. Using this gib, it is not necessary to scrape the surface *A*, and the only surfaces to be scraped are *B* and *C*. Such a gib is adjusted by means of setscrews, generally headless, which are threaded into the slide. Gibs of this kind are entirely unfit for heavy work and are never to be preferred. There may be cases where they can be tolerated but they should never be used from choice. The only spots that really bear against the support are those parts of the gib immediately opposite the setscrews. If such a gib is used with a slide that has a short travel, these few spots will wear hollows in the support. Besides, if any heavy pressure should come in the direction of the arrow the ends of the setscrews would compress the metal of the gib and cause a loose fit. Strange as it may seem, even nowadays this type of gib is used occasionally for heavy-duty machines. The writer saw not long ago a 72-in. heavy forge lathe which was driven by a 50-hp. motor and in which the tool slide gibs were strips of cast iron set up by ½-in. setscrews with ¾-in. points. The same style of gib is used with dove-tail locks in which case it takes the form shown in Fig. 273-b.

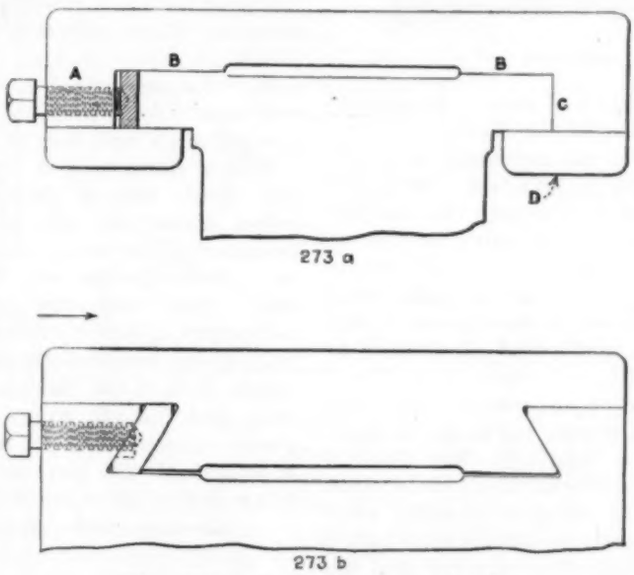

Fig. 273— A simple form of gib

Another simple type of gib is the one shown at *D* in Fig. 273-a. Gibs of this type are often almost entirely free from wear because they are not working under pressure, and it is perhaps the knowledge of this fact that causes designers to overlook the necessity of properly constructing such gibs when they are under pressure. If such a gib is used, for instance, at the rear end of a lathe carriage it will work as a rule without being subjected to any pressure, but when a large piece is turned up there may be a tendency to tip the carriage downward at the front and upward at the rear and such a tendency has to be resisted by the gib. In boring machines pressure may come on such gibs. In milling machines also such gibs may have to resist pressure, and it behooves us in every case to investigate carefully whether pressure may or may not come on these flat gibs. If such pressure and consequent wear may occur, means should be provided for a take-up. As a rule this is not done.

In Fig. 274-a are shown the general characteristics of a gib which, when properly constructed, fills all requirements and should be used wherever possible. It is what is called a "taper gib." This gib furnishes means for take-up and also permits a certain amount of leeway in the machining and scraping of the two members between which the gib is used. Various means are provided to hold the gib in position relative to one of the two members; sometimes to the sliding and sometimes to the supporting member. For instance, in a tool slide of a lathe the gib might be attached to the tool slide or to the carriage. In the carriage of a lathe, the gib must necessarily be attached to the carriage and not to the bed, and in a milling machine table and saddle construction the gib is attached to the saddle—in this case the stationary part.

It may be stated as a rule that the gib should be attached to the shorter of the two members for the following reasons: If the gib is attached to the tool slide of a lathe, which is shorter than the ways on the carriage, then the entire gib will wear and, ordinarily speaking, it will wear evenly; so that after wear has taken place and the gib is adjusted it will still be in good condition. If it were attached to the carriage, that is, if it were longer than the tool slide, then this

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gib might wear over a portion of its length only and adjustment would not be possible. If, for instance, the length of the gib were 30 in. and the length of the tool slide only 10 in., and if this slide had been working over a distance of 5 in., there would be 15 in. of the length of the gib which would be somewhat worn down. And then, in order to adjust the gib, it would be necessary to advance it not less than 15 in. or else there would be a part of the gib high and another part low,

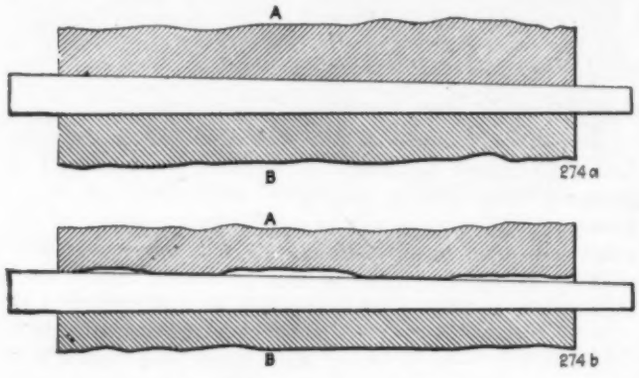


Fig. 274—A taper gib

where it is in contact with the tool slide. An adjustment of 15 in. is, of course, out of the question.

It is often thought that it is not necessary to scrape that surface to which the gib is attached. In a way this is so. There is no need of scraping this surface to an exact relation with the corresponding surface of the other member. It does not need to be exactly parallel or even at any particular angle with the other surface. However, it is necessary to machine or scrape the surface to which the gib is attached as straight as it is possible to make it.

In Fig. 274-b is shown in exaggerated form what would happen if such a portion were not made straight. The gib, being necessarily a relatively thin piece of metal, will follow the irregularities of the piece to which it is attached, particularly so when it is under pressure. As a consequence, there are certain high points which slide along the corresponding member and are very readily worn down. This requires adjustment and a new piece of the gib is brought into play, but this piece also will be worn down because there is only a small amount of surface sliding against the other member. If the gib were thick enough so that it could not follow the irregularities of the piece to which it is attached, such an uneven wear would not occur, but as a rule it is advisable for practical reasons to keep the gib relatively thin.

Thickness of the Gib

Notwithstanding that the piece to which the gib is attached is made straight, there is still some merit in making the gib as thick as conditions will permit. In practically all cases such a gib is attached at one end only, almost always at the thicker end. This may be done either by making the gib with a head or by notching it in and using a collar screw, but whatever the mode of fastening may be it is practically always fastened at one end only. If the gib is thin, then the thin end of this thin gib will easily buckle, so that if the member to which the gib is attached slides in the direction from the thick to the thin end and if there is sufficient pressure against the gib, there may be a tendency to buckle it which would cause unnecessary resistance and rapid wear. It will often be found that under such conditions the thin end of the gib wears more rapidly than the thick end and that there is a rocking motion.

The question is often raised as to which side of a sliding member the gib should be attached to. Take, for instance, the tool slide of a lathe. Most of the work is in the direction from the tailstock to the headstock, so that seen from the operator's side the pressure of a cut comes mostly against the left side of the tool slide. The question then is, should the gib be attached to the left side or to the right side of that member?

Position of the Gib

The two possible constructions of such a slide with dove-tail lock are shown in Figs. 275-a and -b, and the arrow shows the direction in which the pressure is applied. The heavy line indicates the surface subjected to this pressure. The question then is, should the gib be applied at the side *P* or should it be fastened to the other side of the tool slide?

No single answer can be given to this question. Different sets of conditions would require different answers. Some designers claim that the gib should be placed as shown in Fig. 275-a, because then the pressure will come against the gib and it is that part which will wear. As it is easy to adjust a gib they feel that this gives a simple way of maintaining alignment.

Others claim that it should be placed as shown in Fig. 275-b, because then, it is claimed, the pressure comes against two solid surfaces which will reduce the looseness of the construction and the consequent chatter. Both opinions are based on facts but, unfortunately, there are also other facts that should be considered. If, for instance, in Fig. 275-a the upper part slides and has the gib attached to it—in other words, if it is the shorter of the two parts—then it is true that the gib will wear but the lower part also wears correspondingly. And if the upper part has had a limited stroke, it may well be that the lower part has a hollow place worn into it so that no adjustment

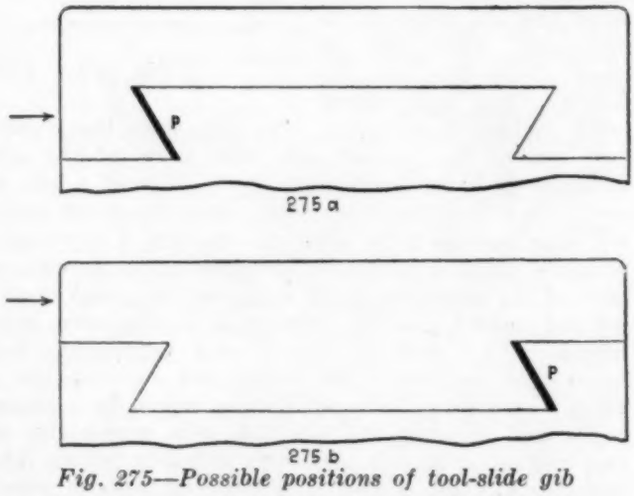


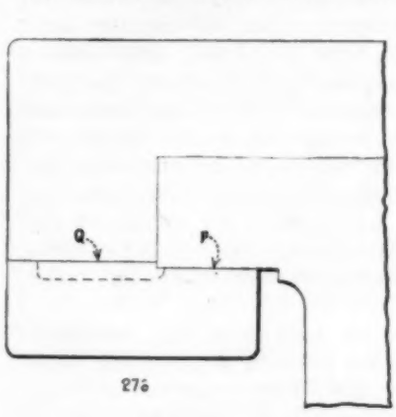
Fig. 275—Possible positions of tool-slide gib

of the gib can restore the original conditions. If, on the other hand, the gib were attached to the lower part, this being the shorter, a hollow may be worn in the upper part; so that again we are meeting the same difficulties. This same thing holds true if the gib were placed as shown in Fig. 275-b, but this time the wear will take place not in the gib and one of the pieces, but in both pieces.

We see, then, that we are not entirely out of our troubles by using a taper gib, regardless of where we place it.

In connection with this unsolved problem, we may ask of what material the gib should be made. It should be said here that these qualities may be of small importance in certain classes of machinery where a small amount of looseness or misalignment would do no great harm, and this question is being discussed here not because it is of great importance in all cases but because it is in some. It is easier to ignore certain fine points when we are aware of their existence than it is to take them into consideration when we know nothing about them.

Various people recommend various metals for gibs. Some engineers responsible for equipment specify phosphor bronze gibs between cast iron sliding parts, probably because they feel that phosphor bronze costs more than cast iron or steel. Others recommend steel gibs, probably because they know that they are stronger than cast iron.



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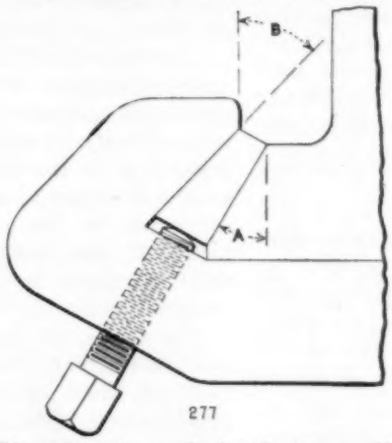

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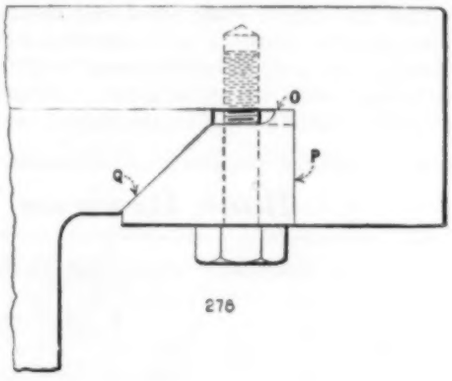

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Fig. 276—The flat gib. Fig. 277—An undesirable taper gib. Fig. 278—Another poor gib

Now, if two cast iron parts slide one over the other and the pressure comes on the gib, there are only two metals which should be considered. The gib should be made either of cast iron or hardened steel. If the pressure comes against the gib and this gib is attached to the longer of the two parts, a hardened gib would give the best results though it would be difficult to make. Scraping being no longer possible, it becomes a question of grinding the gib by trial. However, the result would be excellent. On the other hand, if such a gib were attached to the shorter of the two parts and if there is a variable stroke of the slide so that only a portion of the cast iron may be wearing, a hardened gib would be less good than a cast iron one because with a cast iron gib the wear would be divided over two parts and there would be less of a hollow worn in the longer one of the two parts.

A bronze gib between two cast iron parts is objectionable particularly if the pressure comes against the gib. Bronze and cast iron do not wear well together. A soft steel gib is objectionable for the same reason. We see, then, that after all we will again be confronted by the main problem of the engineer: that is, we must investigate conditions—and then compromise.

There are a few cases where it is advisable to provide a gib on both sides of the slide, but such cases are rare. Where the pressure comes sometimes on one side and sometimes on the other, both sides of the slide as well as the gib are subjected to wear. If all of this wear is taken up by the adjustment of the gib, then the center line of the slide has been displaced. If, for instance, in Fig. 274-a wear had come on both sides, the top slide would be displaced to the left if this wear were taken up by adjusting the gib. In certain machines, such as boring machines or universal millers, it may be essential to maintain the center line of the table or slide in perfect alignment with the spindle of the machine because fixtures or perhaps a dividing head may be located by a slot in the center of the slide. In such cases it may be advisable to provide two gibs, but as a rule the disadvantages of such a construction outweigh the advantages.

It was mentioned that flat gibs should also receive some careful consideration. In Fig. 276 such a gib is shown covering the two surfaces *P* and *Q*. These surfaces are shown to be on slightly different levels. The intention is, of course, to have them on the same level, but it is not an easy thing to have these two surfaces in exactly the same plane. It would then be necessary to scrape the gib to two different levels and this would be almost impossible to do. To overcome this difficulty, such a gib is often recessed as shown in the dotted lines, and the part opposite *P* is scraped to a fit, whereas the part opposite *Q* is merely a heel around which this gib can swivel. This obviates the trouble mentioned before but introduces trouble of a different nature. Made in this way the gib takes the form of a clamp and might readily act as such unless provision is made to prevent it. This is sometimes done by placing setscrews somewhere in the gib bearing against the surface *Q* and preventing it from coming nearer to surface *P* than what is desired. Sometimes the gib is hung from studs provided with locknuts, and again sometimes this gib is provided with such studs and locknuts and also with ordinary capscrews so that the gib can be used either as gib or as clamp. Where such a gib is subjected to heavy pressure, as may be the case at the rear of the carriage of a heavy forge lathe on which a rear tool slide is used, it becomes necessary to have a large number of holding screws so that the heads of the screws shall not dig into the metal of the gib.

Another precaution, and in the same direction, would be to have large hardened steel washers under the screw heads so as to increase the amount of surface subjected to pressure.

Still another kind of gib is illustrated in Fig. 277. This is a taper gib but with its taper crosswise instead of lengthwise. As shown in the illustration the angle

A is 30 deg. and the angle *B* 45 deg. This provides, of course, a means of take-up but the amount of adjustment is necessarily limited. Furthermore, it is exceedingly difficult to adjust such a gib uniformly if it is of considerable length, and in addition it causes unnecessary complication in the planing of the two members. All in all, there is no good reason why such a gib should ever be used.

Still another gib is shown in Fig. 278. It is sometimes made as shown in full lines, and sometimes without the heel as shown by the short dotted line. In the latter case such a gib must be very delicately adjusted in order not to become a clamp, and in the former case it ceases to have perfect contact with the two surfaces *P* and *Q* as soon as it is adjusted, because it pivots around the point *O*. Very little can be said in favor of this type of gib.

Many variations are made on the types of gibs mentioned here. Most of these variations do not serve to improve the construction and find their origin in the desire of the designer to overcome some little local difficulty such as insufficient room. A little patience and a little ingenuity would, as a rule, overcome the difficulties and permit the use of the proper gib construction.

Book Reviews

Engineering Workshop Notes and Data. By E. and F. E. Pull. 126 pages, 3x4 in. Published by Crosby, Lockwood & Son, London, England. Price 2 shillings, 6 pence net.

A convenient little pocketbook of data for shopmen, containing standard tables of threads, tapers, etc., in addition to gear calculations for threads, calculations for gear cutting, hobbing and other operations. The information is all given in line reproductions from sketches and lettered data, presenting the appearance of shop cards or sheets and being somewhat unusual on this account. The selection of material is good, although the small size of the book naturally limits the information on any one subject.

Statistical Abstract of the United States—1923. By the U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, 878 pages, 6x9 in. Cloth boards or paper covers. Sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 85c. (paper covers).

This is the forty-sixth annual issue of the Statistical Abstract of the United States, and, as in previous years, this publication has been prepared in the research division.

In this issue, as stated in the letter of transmittal, a complete revision has been undertaken in order to co-ordinate the publication with the Commerce Yearbook with the aim of securing more complete and better balanced covering of the field of economic and social statistics. Criticisms and suggestions from users of the abstract are stated to be especially welcome in view of the alterations already made and further changes that are contemplated for the next issue.

The contents deal with the following subjects: Area and population, vital statistics, immigration and emigration, education, public lands and national parks, irrigation and drainage, farms and farm property, farm animals and animal products, farm crops and foodstuffs, forests and forest products, fisheries, electric light and power, mining and mineral products, manufacturers, postal service, telephone, telegraph and cable systems, public roads and motor vehicles, steam and electric railways and express companies, internal waterways, merchant marine and ocean shipping, foreign commerce, commerce of noncontiguous territory, prices, wages, money and banking, business finance, national government finances, wealth, state, city and local government finances, army, navy, civil service, etc., climate, statistical record of the progress of the United States, commercial and other statistics of the principal countries of the world.

Manual for Engineers. Compiled by Chas. E. Ferris, Professor of Mechanical Engineering, University of Tennessee. Twenty-sixth edition. Two hundred and forty six pages, 3x6 in., of which 75 pages are advertisements. Published by the University of Tennessee, Knoxville, Tenn. Price 75c.

A compilation of engineering data drawn in part from manufacturers' handbooks, books for engineers and the publications of the professors of the university. According to the preface the object in compiling the book was to secure a medium by which to bring before the minds of the men who control the affairs of the South the strongest possible arguments in favor of technical education as a means of developing the undeveloped resources.

The tables, of which the book is chiefly composed, contain many of the more common engineering data, such as areas, powers and roots, weights of bars, trigonometric functions, logarithms, earthwork tables, formulas for beams, wiring tables and interest tables. In addition there are first aid instructions.

Mechanical World Year Book—1925. Compiled by *Mechanical World*. Three hundred and forty-eight pages of text, 4x6 in., illustrated. Cloth boards. Published by Emmott & Co., Ltd., 65 King St., Manchester, England. Price: net, 1s. 6d.; by post, 1s. 10d.

This is the thirty-eighth year of publication of this useful little reference book. Among the various new features which distinguish the present edition of this handbook attention may be drawn to the section dealing with surface condensers for steam turbines in which the principles governing the design of such apparatus is elucidated at length. The several sections on gas, oil and Diesel engines as well as on suction-gas producers, have been rewritten and incorporate up-to-date information on internal combustion engineering. The section on structural iron and steel work has been extended by the inclusion of a number of useful tables, while a section has been introduced giving practical information on foundations for machinery. Another section on foundry work contains a number of tables and many data on iron mixtures, tests, sands, cupolas, recipes, etc., of service to the foundryman and pattern maker.

Aside from the 348 pages of main text, and a comprehensive index, the Year Book contains an extensive classified buyers' directory, diary and memoranda sheets, and a wealth of additional information of general interest.

Find the Source of Trouble Before Correcting It

By Donald A. Hampson

ONE of the quirks of human nature is that among several people there will be as many different points of view upon a given subject. Nowhere does this characteristic cause more trouble than in the machine shop, where workmen and foremen alike get a wrong slant upon such everyday occurrences as poor work, dull tools, troublesome fixtures and other details that delay production and add to the incidental expense of running the shop.

A milling-machine hand was given a new end-milling cutter of a different type from the ones he had been accustomed to use—a cutter designed to produce more work between grinds—and he did not like it. He preferred the older cutters and the slower speeds necessitated by them. After working for a time upon miscellaneous jobs, kicking all the while about the cutter, he was given a particular facing job to do. When it was completed he took it to the foreman and triumphantly exhibited a very rough surface.

"There," he exclaimed, "see how rough that surface is. I used a fine feed on it too. I told you that cutter was no good."

The foreman needed but one glance at the work before he replied: "The trouble is not with the cutter; it is due to end play in the spindle." And so it proved.

Dull tools set up stresses in machine and work-holding fixtures that they are not calculated to withstand, but it is very difficult to get operators to realize this and if left to their own resources they will almost invariably start to "correct" the trouble at the wrong end.

When Drills Slip in the Chuck

When a drill gets dull, the edges chipped or the lands became worn, it slips in the chuck or the work turns in the fixture. Instead of correcting the trouble at its source, the operator blames the chuck or the fixture and backs up his opinion by applying multiplied leverage to the chuck jaws or hammering the handles of the fixture so that it will hold the work more securely.

Sharpening drills is a matter worthy of more attention than it usually receives. When a drill is ground free-hand, the result is often better on certain classes of work than when it is ground on a drill-grinding machine. In tough metals the tendency is for the drill to wear small at the point, causing it to pinch in the work and slip in the chuck. The hand-ground drill has one lip longer than the other, which allows the drill to automatically free itself. When "pinching" drills are machine ground they should be micrometered at the end and enough of their length ground off to restore the full size before attempting to edge up the lips.

Dull lathe tools cause belts to slip, and work to turn in the chuck, but the lathe hand is pretty sure to lay the blame on the belt or the chuck. The same thing happens on planers. More jobs are loosened from their set-ups by dull tools than by heavy cuts. It is surprising what a difference there is in the size of a cut one can take with a keen tool as compared with a tool that is dull, yet workmen tighten clamping bolts unmercifully in trying to keep work from pushing off on the floor, when the whole trouble is that the tool has to rub off the stock instead of cutting it.

On planer work of relatively light section, the condition of the tool makes a vast difference in the accuracy of the work and the time taken to turn it out. A dull tool will press down an unsupported area as it passes over it and the straightedge will show this part to be high, but with a sharp tool the vertical component of the stresses caused by it is so slight that the tool cuts the metal without distorting it.

The favorite target of many who have to cope with insufficient power is the "loose" belt. Master and man are alike in this popular conception. In their eyes any belt that is not as taut as a violin string is not in proper shape for driving. Seldom do they consider how short-lived is the tightness because the fastenings cannot stay in place; of the increased power needed because of undue bearing friction, or of the stress that reaches the elastic limit of the material.

It is a fine thing to see a belt tight—on one side—with the other side hanging freely and both pulleys tightly wrapped. It is safe to say that such a belt is soft, tenacious and healthy, and it is always far less a slacker than one that is sprung "breaking tight" on the pulleys.

In searching for a source of trouble that is not self-evident, at least to someone in authority, the proper method of procedure is to eliminate one thing at a time. Where several changes or corrections are made in a group, each as a possibility, there is no certain way of telling what was the real cause of the trouble, or which one of the changes corrected it.

Famous Machinists of History

John Rogers (1829-1904)

By H. H. Manchester

John Rogers was born at Salem, Mass., in 1829. At the age of nineteen he was made an apprentice in a machine shop in Manchester, N. H., and he not only served out his apprenticeship, but worked there in all for about ten years.

In the meantime he had been experimenting with modeling in different materials, including not only clay but metals, and believing he had ability in that direction, he went to Rome and Paris in 1858-1859 to study. His progress, however, seemed to him so slow that he became discouraged, and, returning to America, found a job as a draughtsman in Chicago.

He might have remained thus for the rest of his life, if his small group of figures, called "Checker Players," had not made a hit, and copies of it come into demand.

This gave him a foothold as a sculptor, and he resigned his position to devote himself to that art.

He made a specialty of groups of statuettes representing interesting phases of the life of the period. The Civil War, which was in progress, supplied him with some subjects, and he took others from many different phases of life.

He was also the sculptor of a large equestrian statue of General Reynolds, and a large seated statue of Lincoln, both of which are in Philadelphia.

Several of his statuettes are in the Metropolitan Museum of New York City.

Fig. 1—Parts from test cars that are inspected for wear and tested to determine reasons for successful operation or failures

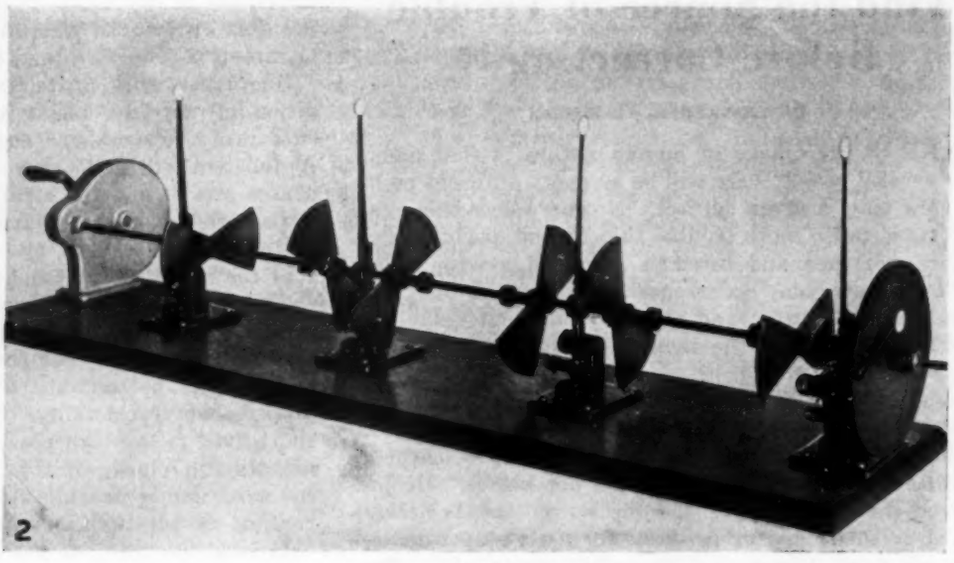


Fig. 2—Mechanism for showing the torsional deflection of crankshafts. It represents a 6-throw crankshaft with adjustable counterweights

In the General Motors Research Laboratory

Dayton, Ohio

Fig. 3—A method of testing the point in the cycle at which piston slap, bearing noises and other audible effects take place

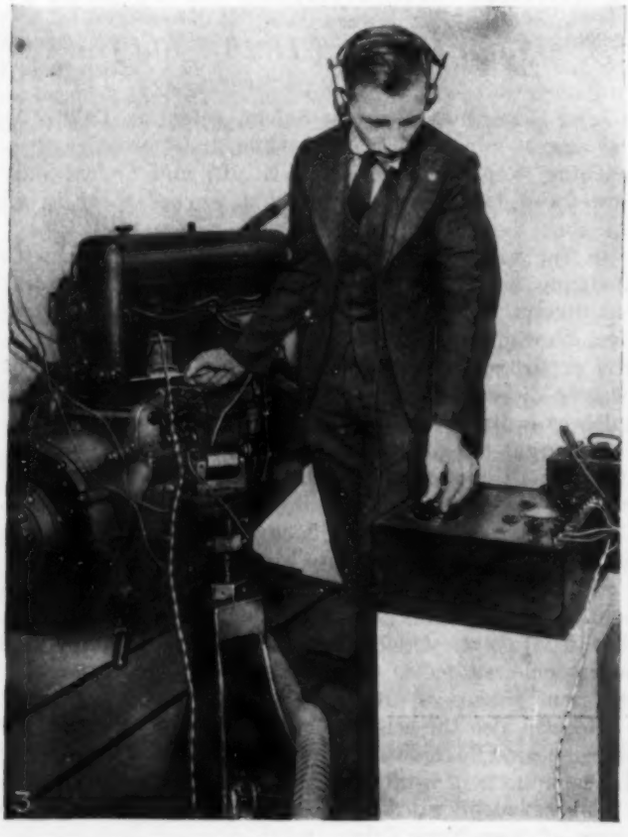
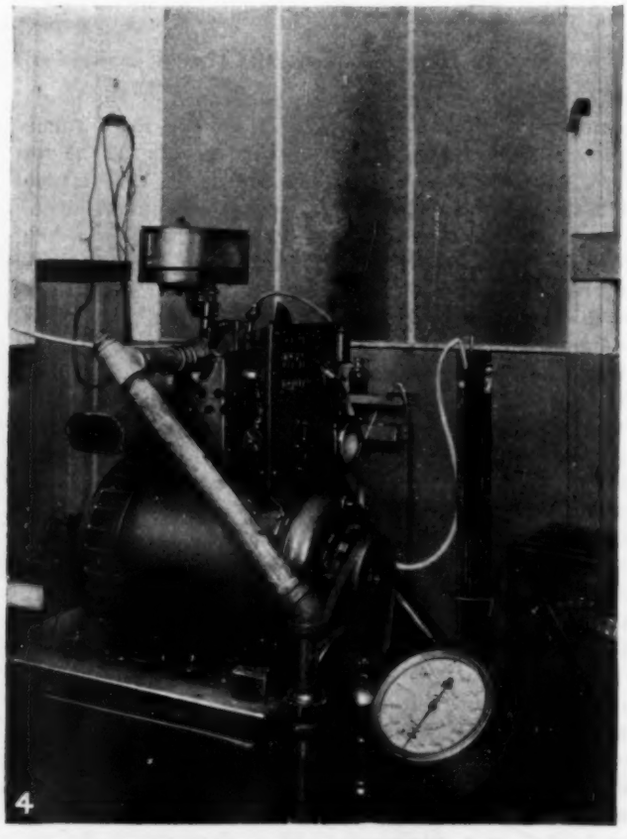


Fig. 4—Studying detonation in cylinders. It resulted in developments that will make possible increased mileage per gallon of fuel



Research—What It Is and What It Isn't

By Fred H. Colvin
Editor, *American Machinist*

Research can save money for any concern if properly managed—Only large concerns can afford to waste money by not having a research department—Co-operative research

IT IS a popular fallacy that only large and wealthy corporations can afford to maintain research laboratories. In reality they are the only concerns who can afford *not* to have them. Only large firms can allow money to be wasted without going into bankruptcy, and the sooner they prevent waste the happier their stockholders will be. The small concern cannot afford to waste the money which always accompanies manufacturing without a full knowledge of the problems involved. And it is only by constant and careful research that we really know the problems of a business and learn how to overcome them. Many large concerns know from sad experience that the small manufacturer who really knows his job, can put quite a crimp in the sales and in the bank account of his larger competitor.

Research has, unfortunately, an ominous sound to many people. They see in imagination long-haired professors, expensive laboratories with awesome special machinery, surrounded by a collection of high-brows who never speak in words of less than six syllables. A visit to the General Motors research laboratory would quickly disabuse their minds for they would see as fine a collection of "regular fellows," most of them young, as can be found in captivity anywhere. Four views from this laboratory accompany this article.

Research is not a haphazard experimenting in the hope that something will turn up. The first step is to know what to "research." Every business has its troubles and the practical research engineer first endeavors to find the biggest and most annoying trouble. Then he studies it carefully and decides how best to tackle the job of sorting out the different phases of the trouble and find a cure for it.

The "Trouble Shooter" Can Help

The "trouble shooter" can be a big asset in locating troubles to study. His co-operation can be most valuable if you take the trouble to cultivate him. He knows what sort of troubles develop in the machines of any line, and how to adjust or change them to keep them on the job. His way may not effect a permanent cure or solve the problem, but it at least affords a starting point. The trouble-man of almost any concern can usually give the research engineer a longer list of troubles in five minutes than could be solved in six months. But he is a good man to cultivate and can be of great assistance in many ways.

Research brings to light many interesting and entirely unexpected results. It occasionally shows us, not only how to improve a device, but how to abandon it altogether. But this is by no means common. We usually improve by slow and gradual changes.

When a problem is presented, the first step is to try and separate the different elements so that each can be analyzed and studied—and this applies to methods of manufacturing as well as to the design of the part or assembly. For example, casting iron in permanent molds has found application in various parts of the motor-car industry. Carburetors, pistons and other parts for cars or accessories are now being made in this way. And the method of casting has affected the machining operations in some cases by allowing higher cutting speeds and in other ways.

Research Men Are Human

The research laboratory does not have to be an elaborate institution. It can be a corner of the shop. But it should be kept separate by partitions, not so much to preserve secrecy as to prevent any interference with production. Both production and research should be independent, but brought together through the manager's office. They should co-operate fully, but the manager is the one to decide when changes are to be made in design or methods.

Research men vary as do all others. Some have imagination and intuition which seems to smell out the trouble and find its remedy. Others plod along but finally find a solution. Still others have all sorts of fantastic notions, and little or no idea as to costs, the same as inventors. But the research man who knows his job does not expect to perform miracles. He tries to learn from everyone he meets in the shop. He tackles one phase of the problem at a time, for after all research is simply attacking a problem systematically and licking it.

Research need not be confined to large corporations or even to one company. There are instances of co-operative research that have given good accounts of themselves. There is opportunity for more work of this kind. It has worked very satisfactorily with a group of steel foundries. Why not in other places?

Research should not be confined to remedying troubles, but should seek improvements in methods and in machines. The machine-tool builder, for example, could well study the cutting action of tools more closely. The thrust due to cutting has a direct effect upon the wear of slides and bearings, and should be studied even more than has been done. One of the problems of today is heavy feeds rather than depth of cut. Faster feeds mean a direct saving in the time of machining. The power required for feeding, say a half-inch per revolution, might well be studied and mechanisms designed to accomplish it. The modern lathe tool will probably stand such a feed although the work might

not. At any rate it is a suggestion that may be worth considering.

The application of new materials with different physical properties and characteristics than those that have been used before opens up particularly adaptable activities for the research man.

The famous airships, Shenandoah and Los Angeles, were possible only by using a material for the rigid framework that is almost as strong as steel, but one-third the weight. Duralumin—an interesting material, as well as the many other possible light-weight aluminum and magnesium alloy materials, is just beginning to open up a new era in all lines of mechanical endeavor.

It is well to remember that many machines wear out due to the dead weight of the moving parts. The use of materials with new physical properties changes our whole previous ideas of the proportioning of parts, speed, weight and the many other factors that enter into the design of mechanical things.

Of course, new materials, like steel in its early days, are often prohibitive due to cost of manufacture. This again becomes an active field for the research man to supply a new material at reduced cost, by improved processes, once the demand is sufficient to indicate the need for such developments.

Such materials as rubber and the phenol-condensation compounds, with characteristics all their own, offer limitless application in many fields of mechanical activity where they have not even, as yet, been given passing consideration.

Alloys with high porosity have characteristics that make possible many new developments or worth-while improvements in the existing mechanisms.

Durex is a development of a research organization. It is a bronze bearing-alloy having high porosity, capable of absorbing large quantities of lubricant within itself, and is typical of this latter class of material.

The good research man will not be heartbroken if the manager fails to adopt all of his best ideas. He knows that he must usually compromise between the ideal and the economical. But he always finds the best solution before he starts to compromise. If he begins compromising at the start, he will be beaten before he gets the best for the company.

Knowing when to compromise is an art and spells progress.

Where Is the All-Round Mechanic?—Discussion

BY F. G. MASON

The article of A. L. De Leeuw under the title given above, published on page 851, Vol. 61, of the *American Machinist*, was of great interest, but I want to question some of the statements contained therein.

The all-round mechanics are not extinct though it is deplorable that there are so few of them, but there are reasons. The real mechanic has never been paid enough to compensate him for the time and trouble he has spent to become one. Thirty years ago, an all-round machinist was looked up to and respected and his position in the affairs of men was an incentive for bright boys to learn trades. There were not enough openings to accommodate all the applicants for apprenticeship. Boys were willing to serve the first year for three dollars a week and usually did not receive more than two dollars a day during the last year of apprenticeship. True, in some cases they received a cash bonus on completion of their apprenticeship.

As modern production methods came into use, the apprentice system began to decline. The specialist began to appear and the all-round mechanics were used as foremen. Machine operators were made from raw material but they never became all-round workmen.

In the toolroom we still find many real mechanics who have learned the trade, but in a different way than the apprentices of the old school. They have had the most modern tools and equipment at their command and while they should be as good as the old timers, they are not.

I am fortunate in having one of these old timers in my employ at present, also several toolmakers, and diemakers, all of whom are above the average caliber, but when there is any real job to be done, it is given to the old timer, for he always "gets there."

The old timer has acquired the modern methods to add to the old ones. He is a superior article, possessed of brains. Having brains to start with, necessity developed him and he could accomplish wonders with very little equipment.

Mr. De Leeuw says the old timer is dead and we do not want him back. The medium sized plant does want him back and sure wants him badly. If the medium sized plant were strictly modernized, it would employ a mechanical engineer, a steam engineer, a maintenance man, an electrician, a tool designer and a toolroom foreman. One first-class all-round man could and would handle the whole outfit, which I can prove.

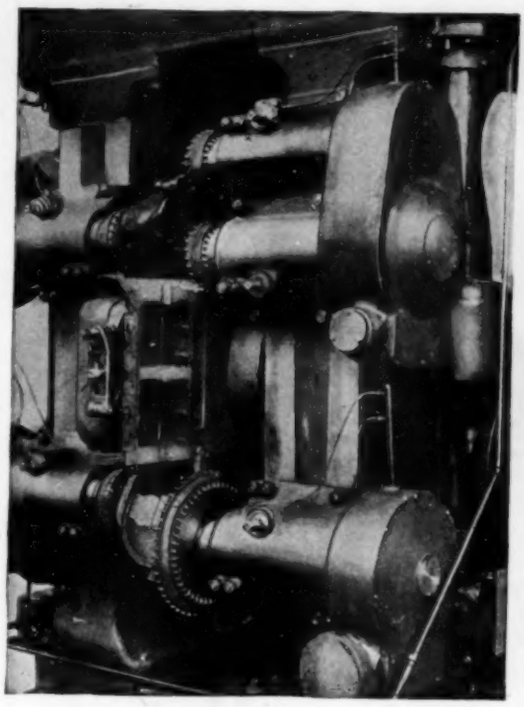
I believe that our system of rewarding the machinist is all wrong. A hod carrier gets as much as a machinist; a plasterer about three times as much, and anyone with brains who could not become a plasterer in one year's time has no adaptability.

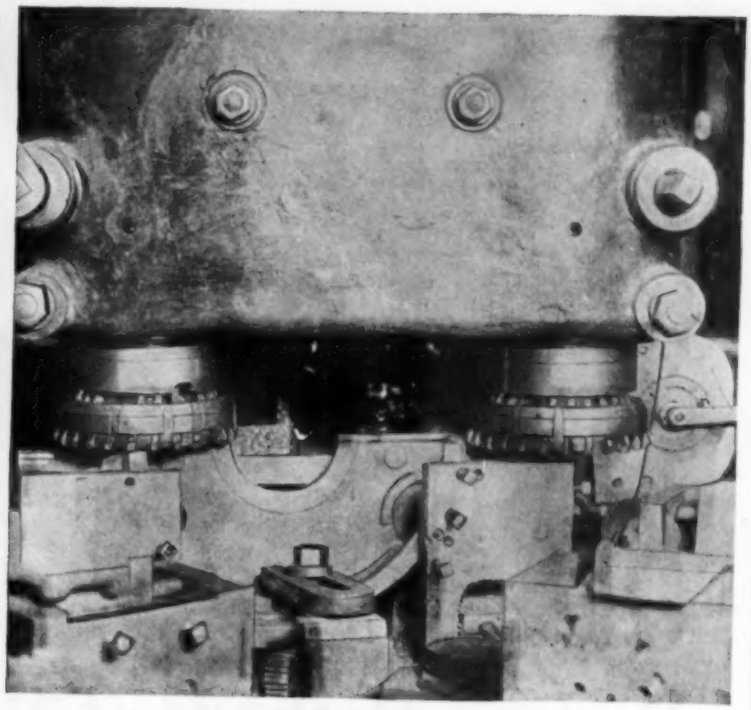
How the Booster Helps

The use of the booster on the trailing wheels of a locomotive gives sufficient additional drawbar pull to start many trains that would otherwise require a pusher. And unlike the pusher, it can be instantly thrown out of gear as soon as the need is over. The pusher frequently has to run many miles before it can return to the starting place, burning coal, wearing out the locomotive and rails and being in the way of other traffic.

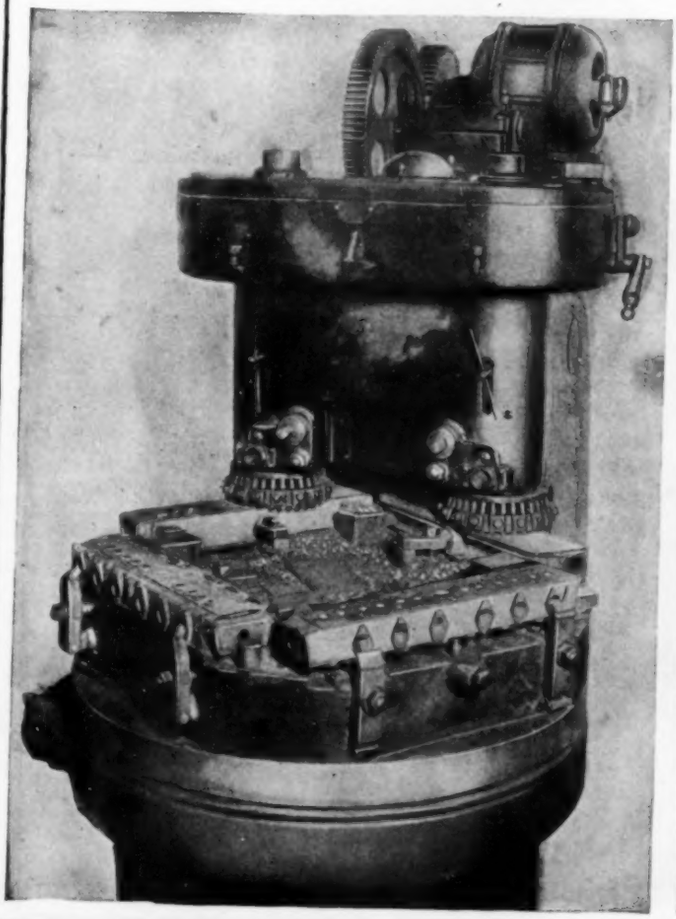
The percentage of increase in power depends, of course, on the type of locomotive to which the booster is applied. On a 2-10-2 locomotive the increase is about 10 per cent, on a 2-8-2 about 23 per cent, on a 2-6-2 about 27 per cent and on the Atlantic or 2-4-2 type, about 40 per cent. In passenger work with numerous stops, the booster frequently enables locomotives of the Atlantic type to get trains under way as quickly as larger locomotives. And as these locomotives have sufficient power for maintaining speed between stations, the use of the booster allows the heavier locomotives to be kept for through trains.

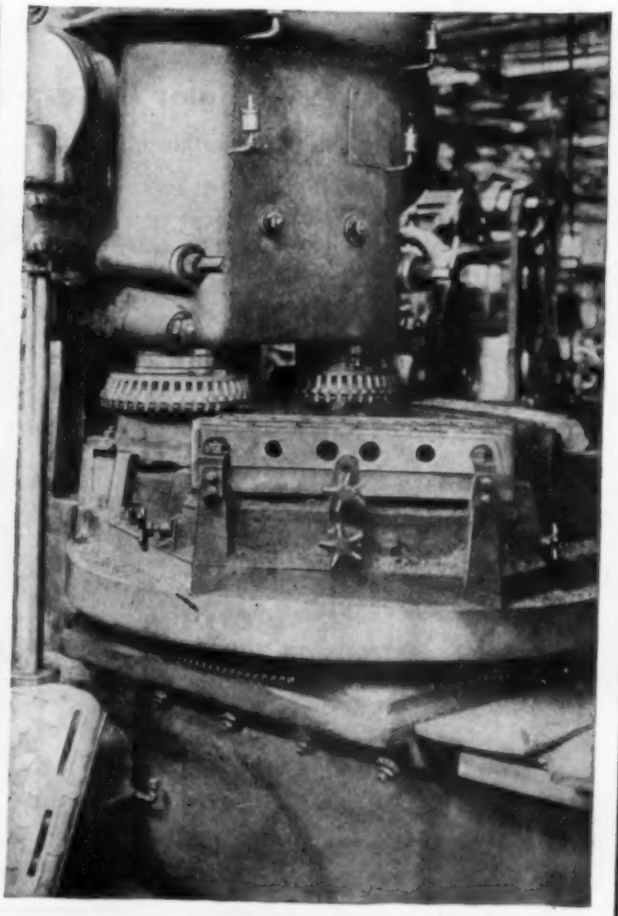
The increased power frequently halves the time required to get a train up to speed, and adds but 5 per cent to the static stresses. This slight increase is well taken care of in both locomotives and bridges.

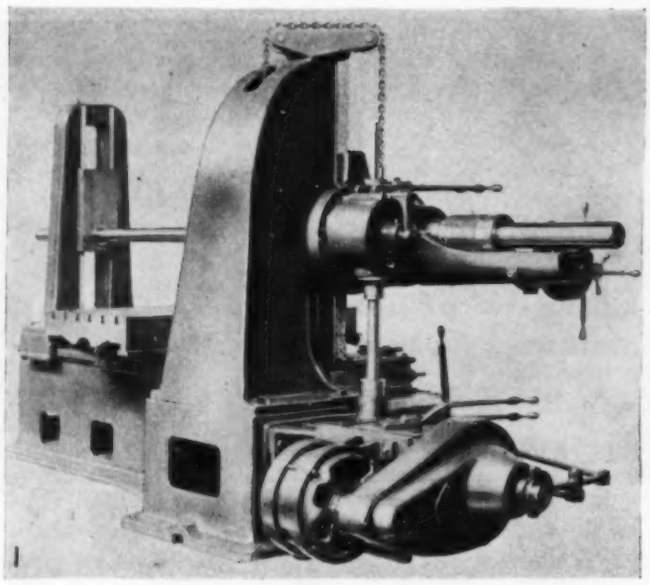


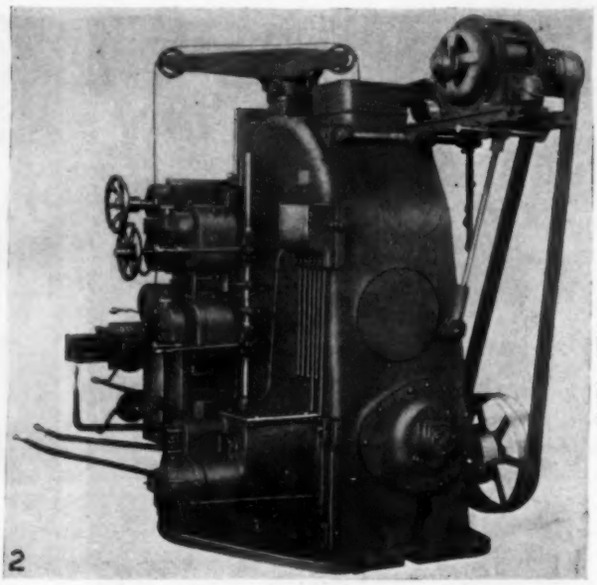


Continuous Milling in Automotive Production







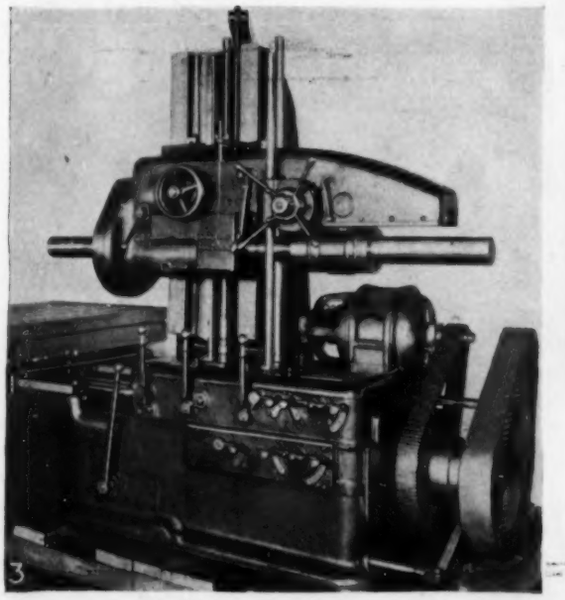


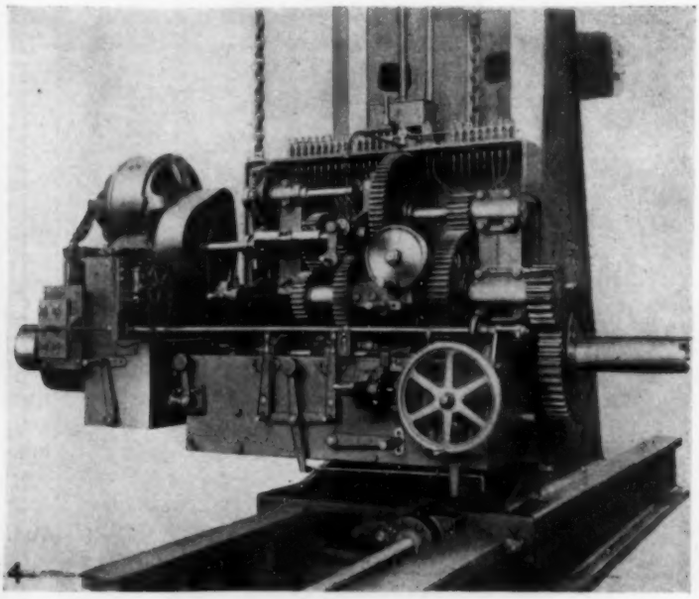
Modern Methods of Mounting Motors

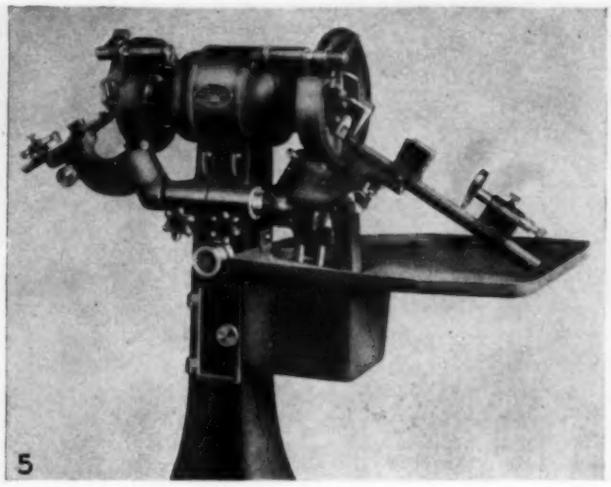
THE beginning of a series of illustrations showing how leading builders of machine tools apply motors to their machines. Some of the methods show how different designers solve the problems of attaching motors to machines originally built for belt drive while in other cases the motor applications have been carefully considered when designing the machines.

Motor Drives on Boring Machines

1—Lucas horizontal boring-machine. 2—Bullard vertical turret-lathe. 3—Universal horizontal boring-machine. 4—Sellers floor boring-machine.







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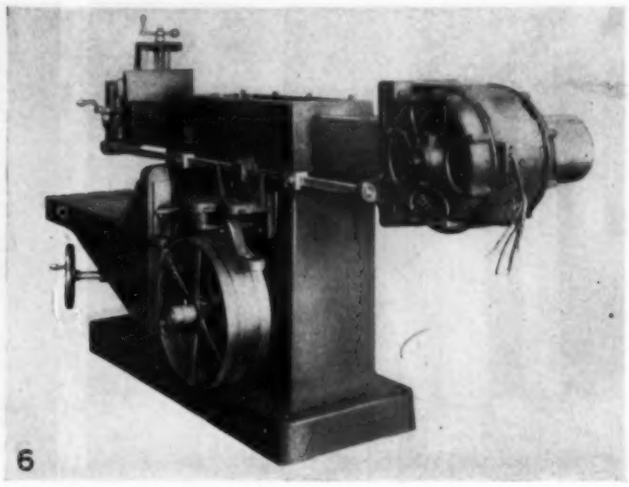

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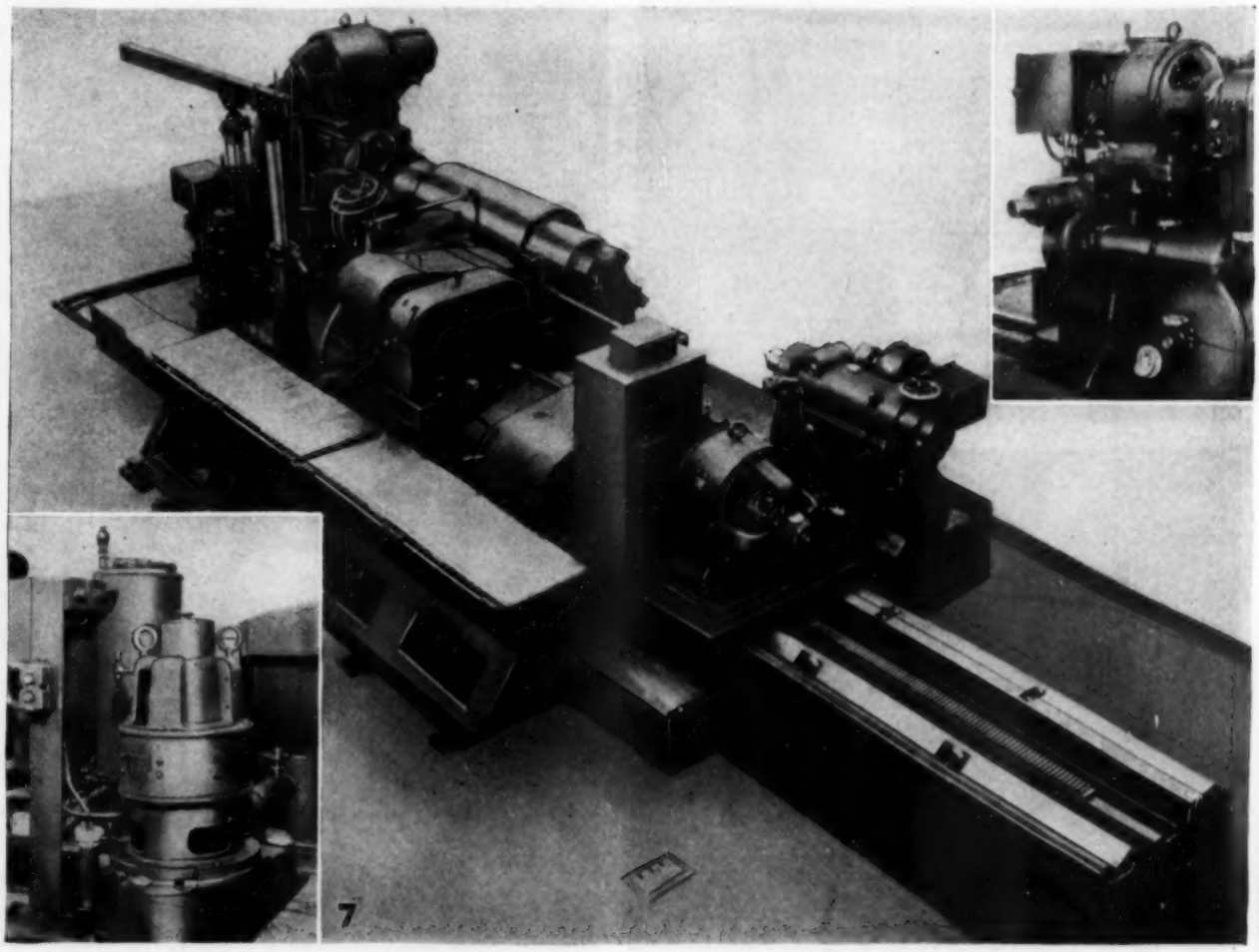
Motor Drives on Grinding Machines

Applications to machines of different types and sizes

5—Gallmeyer & Livingston twist-drill grinder. 6—Automatic Machine Co.'s traveling-head surface grinder. 7—Norton roll grinder with four motors. Wheel-drive motor, 40 hp.; headstock motor, 20 hp.; footstock and water pump motors, 2 hp. each. The two latter are shown as insets.



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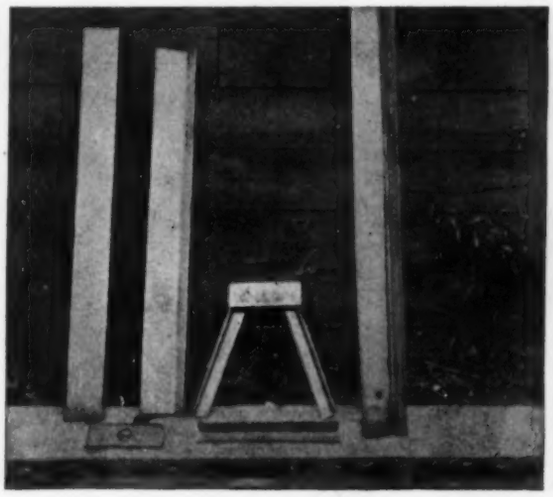
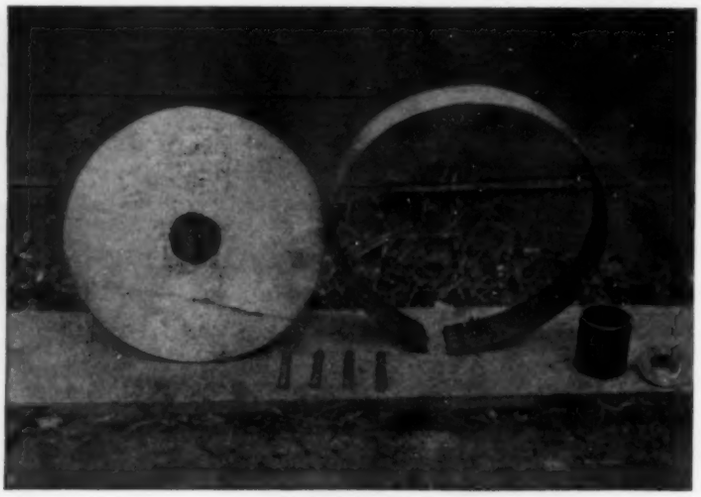
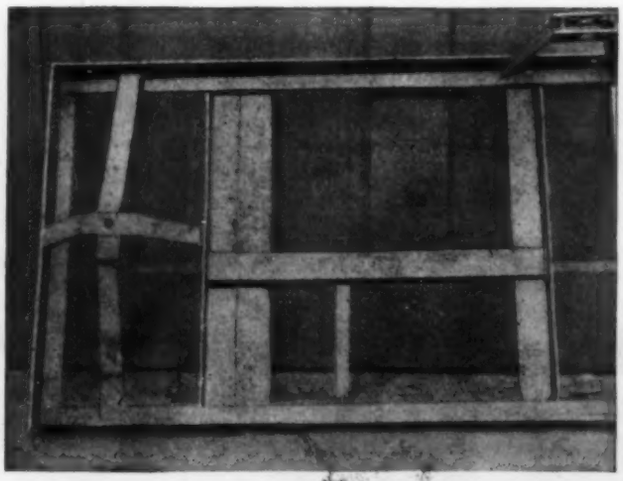


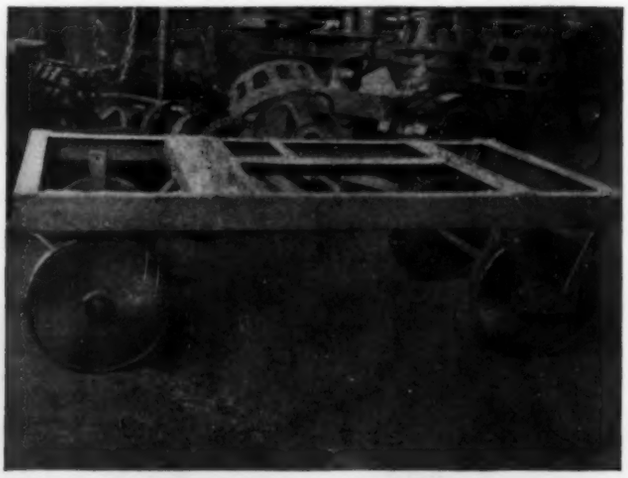


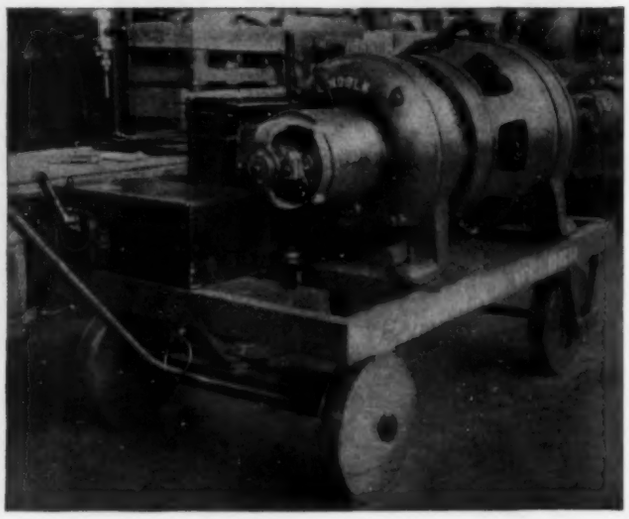
A Welded Welder Truck by Welding Students

Steel wheels, made on automatic seam welder, replace cast wheels and eliminate breakage. Welded-steel truck weighs 215 lb. and costs $15.59 as against 320 lb. for old truck and a cost of $34

Made by customer and sales students at Lincoln Electric Co., Cleveland, Ohio







Fitting Spindle Bearings on the Heim Centerless Grinder

Special Correspondence

Preliminary boring operations—Housings scraped to alignment — Final boring after bearings are fitted—Scraping in the spindles

UPON no part of its mechanism is a precision machine more dependent for its accuracy than upon the bearings in which the spindle runs, and in no class of precision machinery is this more true than in grinding machines. Any departure from absolute alignment of the bearings or from true roundness of the journals will immediately be reflected in the quality of the work coming from the machine. The importance of good spindle bearings is recognized by the builders of the Heim centerless grinding machine, and careful consideration is given to the methods of securing accuracy and precision in this respect.

The Heim machine carries two wheels, one of them an abrasive wheel that is run at a speed of 1,450 r.p.m. and the other, termed the "regulating wheel," at a much slower, and variable, rate, ranging from 18 to 480 r.p.m. Both wheels are rather heavy, being 16 in. in diameter when new and having maximum face widths of 8 in. Notwithstanding the slow rate at which one wheel revolves, the spindles are of the same size, the bearings of the same construction, and the same care

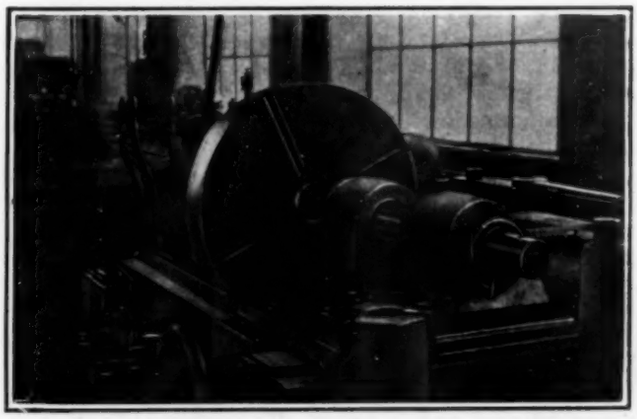


Fig. 1—Boring parallel hole in the bearings

is exercised to secure alignment and full bearing surfaces for the journals.

The wheel-slides are rigid and heavy castings, the shape of which may be seen to advantage in Figs. 1, 6 and 7. Though there are differences in the construction of the two heads, made necessary by the adjustments required of the machine, so far as the wheel bearings and housings are concerned they are identical. The first operation of boring the housings, shown in Fig. 1, is performed on a standard engine lathe after the slides have been machined to fit the ways of the bed upon which they bear, but before the sliding bearings have been finally scraped.

The regular cross-slide is removed from the lathe and a large plate, the upper surfaces of which have been machined to the same gages as the top of the machine base, is substituted for it. This plate is bolted to the wings of the carriage and has no movement relative to it. The wheel-slide to be bored is thus mounted on the lathe in exactly the same manner as it is later to be mounted upon its machine, and is free to slide in a direction at right angles to the centerline of the lathe.

The boring bar carries two cutters of the usual type and is swung upon the lathe centers. As all the machine-slides to be bored are of the same general shape and dimensions, no vertical adjustment is necessary or desirable. On some of the machines one of the wheel spindles is inclined at an angle of 3 deg. from the horizontal, and to bore these slides a plate similar to the one described, but planed on its undersurface to the required angle, is substituted.

After centering the bar widthwise of the housing by moving the slide upon the plate, the slide is clamped in position and the hole rough-bored. Both housings must be faced and one of them recessed at one end. For this work various facing heads with inserted cutters are used. One of the heads is shown standing on the wing of the carriage.

The rough-bored hole is, of course, parallel; and as both bearing seats are required to be tapered there

Fig. 2—Taper-boring cutter and reamer

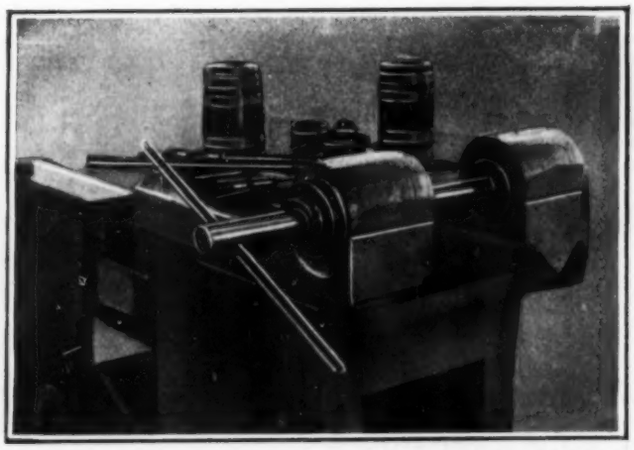


Fig. 3—Scraping the taper bores to alignment

are further operations performed at this setting. On the lathe-shears in Fig. 2 the taper-boring tools are shown. The first tool, *A*, is a single-piece bar with one end enlarged and planed to the angle of the taper bore. Detachable cutters are bolted to the angular surfaces and ground in position.

This bar is used upon the lathe centers and the work fed to the cut by traversing the lathe carriage by hand. When one housing is bored (the operation is one of reaming rather than boring) the bar is turned end for end on the lathe centers to bore the other one. The tapered shell-reamer *B* is used in the same manner to finish the bore. Suitable stops on the lathe carriage regulate the depth to which the taper reamer is sunk and thus determine the final mean diameter of the holes.

The work at this stage being completed, the slide is sent to the assembling department where it is first scraped to a full bearing upon the machine bed with which it is to be assembled. The operation is done after the boring for the reason that the removal of metal during the boring operation is likely to cause a slight warping of the casting and thus any benefit derived from previously scraping it would be lost.

The machine, with both slides fitted, is then moved across the floor to the station of the fitter whose job it is to assemble the bearings and spindle. In Fig. 3 is shown a stage of the first task, which is to scrape the taper-bored housings to fit the bronze bearings.

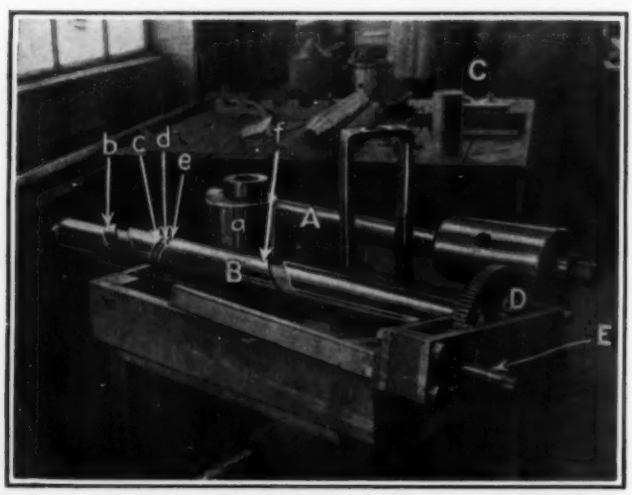


Fig. 4—Aligning bar and finish-boring bar

The bearings come to this station from the lathe department all finished except that the bores are a trifle under the sizes of the respective journals. The bores are, however, as smoothly finished and as accurately fitted to a gage as if the sizes were final.

The tools used by the fitter are shown in Fig. 4, lying upon a high truck, or wheeled stand, upon which they may be trundled about at the convenience of the workman. The parts *A* and *a a* are, respectively, an alignment bar and two hardened and ground taper bushings. The latter are of the same size and taper as the outside of the bronze bearings, with bores that are a rather close fit upon the bar. These parts are the same as are shown in Fig. 3 in position in the wheel-slide.

The operation is almost explained by the picture. The housings of the wheel-slide are scraped to the tapered bushings, and as the scraping proceeds the bar is passed through the bushings from time to time until the bushings are firmly seated and at the same time the bar is free to turn. This assures that the separate bores are in alignment. Ring-nuts, threaded to the bar, allow

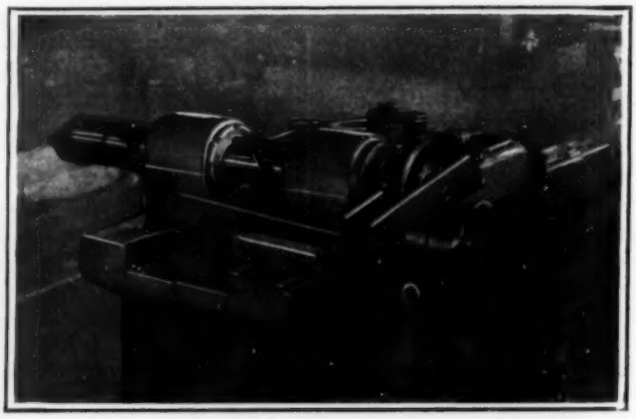


Fig. 5—The finish-boring bar on the job

the operator to bind the bushings to the bar and turn all parts as a unit; as is desirable in the preliminary stages of the scraping to locate the "high spots."

But alignment of the cast-iron housings is far from being the last word in accuracy of spindle adjustment so far as these machines are concerned. The bronze bearings, which may be seen standing on the wheel-slide in Fig. 3, have yet to be bored to size. The boring bar *B*, Fig. 4, is used for the purpose.

Refinements in Bearing Construction

When the bearings are in place in their respective housings and drawn to their seats by the ring adjusting nuts, as they are in Fig. 5, the bores are already nicely finished and in practically perfect alignment; a job that would have been considered "good enough" for *any* machine until a few years ago; but the makers of this machine consider it only as a preliminary step in the direction of final accuracy.

The rear bearing is nominally $\frac{1}{8}$-in. smaller in diameter than its mate, and both are 0.005 in. smaller than nominal size. Aside from the reduced extension at the end which houses the lead screw, and which is noticeably smaller in the picture, the boring bar presents four different diameters. From *b* to *c* the diameter is a running fit in the present size of the rear bearing. In the annular groove at *d* is a cutter that is set to bore

that bearing to finish size. From *e* to *f* the bar is a close fit for the finished bore.

Similar conditions exist at the place where the bar enters the front, or main, bearing. The bar, therefore, enters the assembled bearings as far as the respective cutters will allow, and is supported by them in advance of the cutter throughout the boring. Immediately behind the cutters the increased diameters of the bar take over the duty. The bar is thus supported by a practically full bearing all the time during the cut.

A finely-pitched leadscrew is threaded axially into the small end of the bar, and when the yoke *C*, Fig. 4, is in position as shown in Fig. 5, the outer end of the screw is fastened to it by means of a tapered cross-pin. As the yoke is attached to a special ring-nut screwed to the large end of the rear bearing the screw is held stationary, and as the bar is revolved it is also drawn forward as it turns upon the thread of the screw.

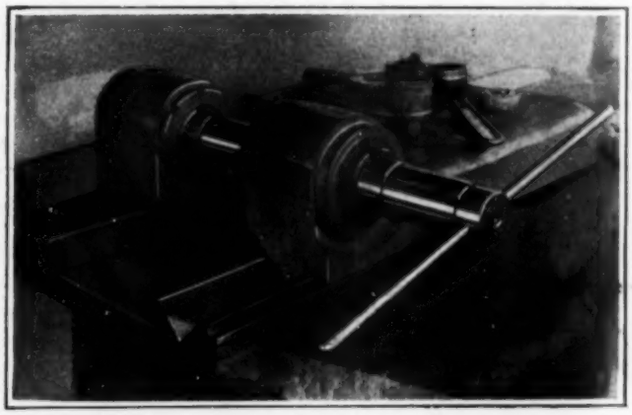


Fig. 6—Scraping finished bores to test bar

The gear *D*, Fig. 4, is keyed to the end of the bar and meshes with a pinion upon the inner end of the stud *E*, so that to drive the bar a handcrank may be placed upon the squared end of the stud. A much less strenuous and more rapid method is to use an electric drill fitted with a squared socket; and this is the means usually employed, as a glance at Fig. 5 will show. The helical grooves in the bar are to carry out the chips.

The set-up is very rigid, the bar is amply supported by the bearings both before and behind the cut, and the drive is a floating one; as the long tail of the yoke inclosing the gears rests, without fastening, upon a block of wood laid upon the ways of the machine bed and furnishes the necessary thrust point to resist the driving force. The boring bar is of sufficient size to preclude the possibility of flexing to a measurable extent, and therefore the alignment of the finished job may be depended upon.

After being bored, the bearings still have to be scraped, and instead of scraping them directly to the spindle the hardened and ground test-bar shown in Fig. 6 is used. The bearing surfaces of this bar are just enough larger than the journals of the spindle to provide for a suitable oil-film when the spindle is in place, and the position of the boxes is not disturbed after the spindle is installed.

The final operation is the fitting of the spindle that is to remain with the slide. There is really no fitting to be done, as the preceding operations assure the outcome, but it is the fitter's duty to put the spindle in place and see that it is ready to run.

Specifying Performance Requirements Rather Than Physical Components

By F. L. Rhodes

It has been my experience that flexibility of production has been obtained and the path to further improvements kept open by specifying, as far as possible, the performance requirements for completed things. An example of this would be specifying the electrical properties of an insulating compound, such as its insulation resistance, dielectric strength and specific inductive capacity, rather than the percentages and grades of different rubbers, oils, waxes and fillers that may enter into its composition.

There are in existence specifications for some insulating materials which rigidly specify composition. From our contact with manufacturers, we have found a general opinion to exist that these requirements are not the best that could have been devised, from the standpoints of cost, electrical properties or durability, and that such requirements may be fully complied with and yet inferior material produced.

Equivalent Results with Different Insulators

Under the plan of specifying results, we have had a number of manufacturers preparing wires under the same specifications. No two of these manufacturers are employing the same insulating compounds in the same proportions, and yet, after a number of years' experience with each of them, we are unable to point out one of these compounds as being distinctly better than the others. This feature has its advantages from the standpoint of diversifying the raw material demand.

The specifying of composition in such materials as rubber insulating compounds is also a deterrent to the manufacturer in his desire to improve his own product. Recently a manufacturer whose research facilities along his own line are very complete, gave us the results of tests involving the preparation of several hundred samples of a special wire. In this case, working along parallel lines, we had already arrived at a solution of the problem which showed some advantages over this manufacturer's proposal. Such co-operation, however, deserves the purchaser's encouragement, and an effective way of extending it is the drafting of specifications in such a way that improvements of mutual advantage may be most readily developed.

Mechanical Tests in Hardware Specifications

In specifications for hardware we depend upon such mechanical tests as can be made by the inspector in connection with his examination for dimensions and assembly details.

There are, of course, some materials to which tests to determine suitability are not as readily applied, as to those referred to above. Typical of these materials are paints and timber preservatives. But even for these materials we have found it practicable to eliminate all but a few fundamental composition requirements. Thus we have purchased paint in large quantities without specifying the composition of the pigment, depending upon color, fineness and insolubility to indicate acceptable characteristics. Under this arrangement, the chemical tests resolve themselves into a fairly simple determination of the purity of the vehicle.

From a talk before the American Engineering Standards Committee.

Ideas from Practical Men

Keeping Buffing Wheels in Condition

By Herbert C. Crawford

The illustration shows a busy corner devoted to buffing-wheel maintenance in the plant of the Hoover Co., at North Canton, Ohio. This department is located in a very light part of the shop and every modern convenience is provided to make the work as easy and efficient as possible.

The glue is heated by most approved methods and the wheel supported over the glue pot by the wooden stick and uprights shown. The wheels, after being

Keeping buffing wheels in order

carefully coated with glue, are passed to the second man who rolls them in the trough of abrasive, as can be seen. There are three of these troughs, each having a heating coil so that the abrasive may be warm when applied. Heating in this way prevents chilling the glue on the wheel and gives a better bond, so that the glue holds the abrasive more firmly.

Behind the troughs and glue pots are the storage racks, one bin being assigned to each operator to hold his day's work, it being the policy of the management to keep a large supply of wheels on hand in order that the glue may be thoroughly dry before the wheels are used. This policy also prevents machines ever being idle from lack of wheels.

Another feature of the buffing department is the practice of using two wheels on the same end of the spindle on some operations. As a rule one wheel is for roughing and the other for finishing—or "rough and fining" wheels as they are frequently called. By this method the work is both rough and finish buffed at the same handling.

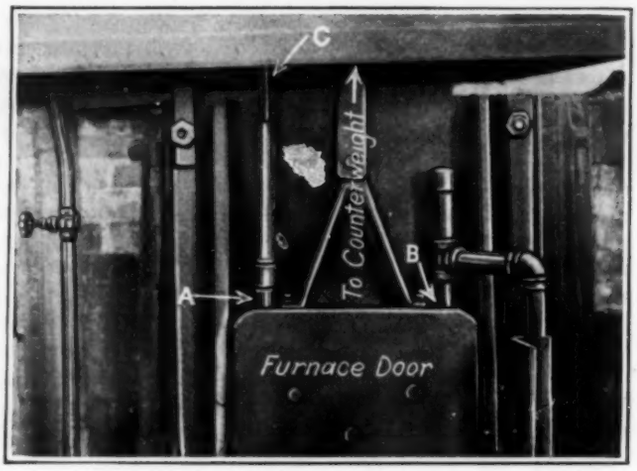
On a few jobs, such as buffing the edges of flat-sided thumbscrews or similar pieces, a buffing wheel having a groove in the face of the radius desired is used, resulting in a nice, rounded edge with very little movement of the work. This is one of the many kinks for saving time and labor. Every wheel also has its exhaust hood and the room is kept clear of dust and well ventilated, as being conducive to health and comfort.

A Water-Cooled Door for a Furnace

By John McDonald

The door of a gas- or oil-fired furnace needs relining at frequent intervals. The sudden cooling and reheating of the bricks as the door is opened and closed, as well as the jar incidental to closing it, causes them to become dislodged and in a short time the lining is destroyed. After experiencing the usual amount of trouble from this cause for a time I conceived the idea of making a water-cooled door for our furnace.

The door casting is cored out to form a water chamber and is tapped at *A* and *B* for the piping. A piece of 1½-in. pipe is screwed into the casting at *A* and a piece of ¾-in. pipe *C* is connected to the supply pipe. No joint is necessary, as the lower end of the smaller pipe just enters the larger pipe when the door is down and



A water-cooled furnace door

the length of the 1½-in. pipe is sufficient to allow the door to rise to its limit before the end of the small pipe meets with any obstruction.

At *B* is a short riser of 1½-in. pipe with a tee in it through which the water runs to waste. The end of the outlet pipe below the elbow enters a larger pipe leading to the drain. The upper end of pipe *B* is left open so that there will be no siphon action to empty the door of water.

The water chamber in the door is always full and the level of the water stands at the tee. A valve in the supply pipe regulates the flow, which should be just sufficient to keep the water in the door from boiling.

There is no danger of an explosion as the water is nowhere confined, and the door cannot get too hot unless the valve in the supply pipe is closed and the water in the chamber boils away.

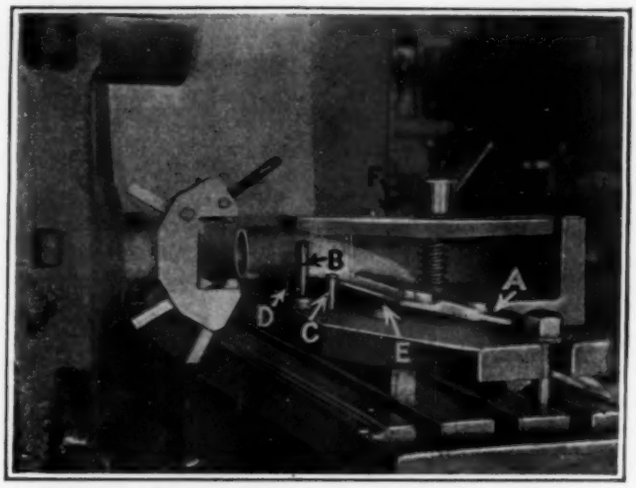
IDEAS FROM PRACTICAL MEN

Simple Clamp for an Awkward Piece

By Clifford H. French

The angular connection for a vacuum sweeper is not easy to hold for machining but the clamp shown solves the problem in a simple manner.

The piece is located by the back edge *A*, centered between two posts, one being shown at *B*, and positioned by the pins *C* and *D*. Another pair of pins, one of which



Hollow milling an awkward piece

can be seen at *E* adds to the support and keeps the piece at the proper angle. The single clamp *F* hinged at the rear, holds the work while the end is being turned with the hollow mill shown.

The work is fed straight in to the cutter head by the cross movement of the table. The head carries four cutters, the first two turning the outside of the connection. The upper back cutter faces the end while the lower cutter cuts the chamfer.

The fixture can be quickly operated and the whole set-up shows an appreciation of simplicity in design. It is in the plant of the Hoover Suction Sweeper Co., North Canton, Ohio.

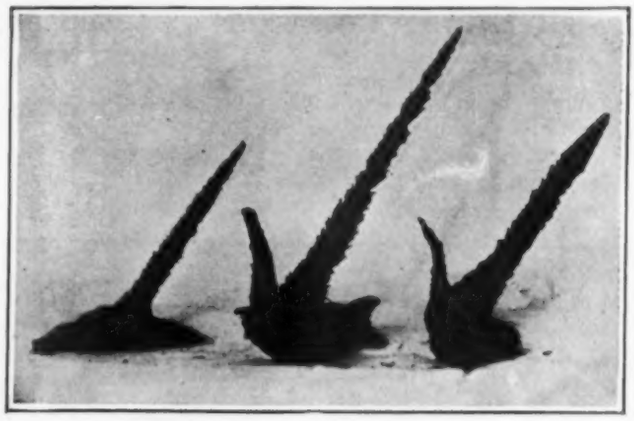
Peculiar Formations of Steel and Abrasive Dust

By George Wilson

Thinking it might interest your readers I am inclosing a photograph of formations that take place under a small grinder that is run on a long job of several hours grinding.

The shape of the base of the formation is made by the catch trough, some 4 in. beneath the wheel. The formations takes place very slowly, gradually increasing in growth-speed as it builds up. The ends of the formations are kept a dull red glow from the descending sparks or dust from the wheel. As the heights increase the ends grow brighter until, when nearly touching the wheel, they are almost incandescent and grow quite fast.

While the formations are very brittle, they have sufficient strength to permit them to be picked up out of



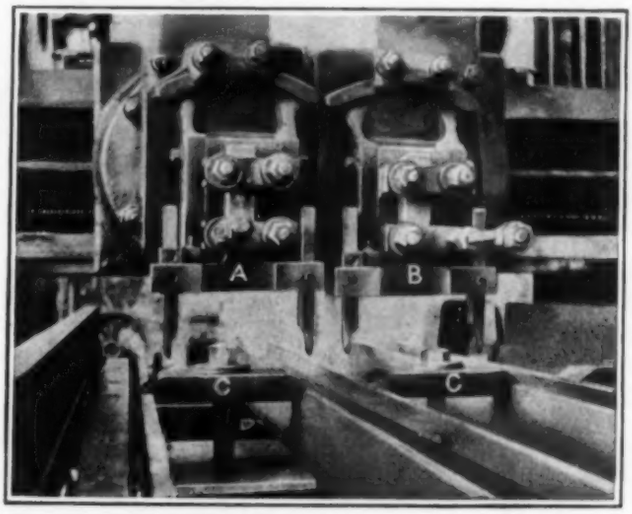
Formations of grinding dust

the trough. To grow a formation as long as the wheel height permits, takes about two hours of grinding, including stops to insert and remove the ground pieces. A full grown formation is about 4 in. long.

Planing Four Slides at Once

By Herbert F. Crawford

A neat and simple method of finish planing four printing-press slides at one setting, is shown herewith. The special double toolholders *A* and *B*, each carry two tools that are held in fixed positions by headless setscrews. By the use of these tools it is easy to plane



Planing four slides at once

the four slides shown at one setting. The setting of the slides is made easy by spacing blocks on the planer table, while the clamps *C*, with their shoulders and holding lips, can be readily set and are not in the way of the tools.

It will also be noted that each toolhead has an extension bolt by which the operator can readily lift the clapper block when desired. This method is used in the shop of the Kelly Press Division of the American Type Founders Company.

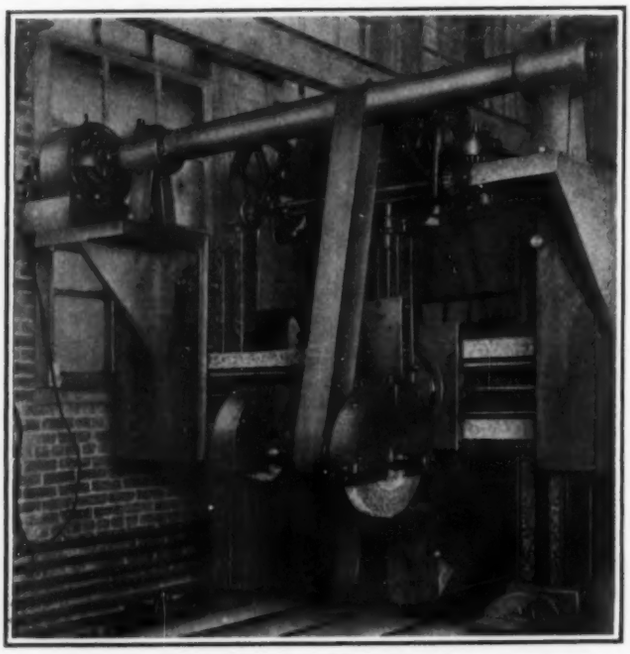
IDEAS FROM PRACTICAL MEN

Planer Converted into a Surface Grinder

By J. K. Smith

Having some long, narrow pieces of very hard material to be surfaced, we converted one of the planers into a grinding machine as shown in the illustration.

Two brackets were mounted on the cross-rail to support the motor and the long drum for the belt to the



Surface-grinding attachment on a planer

wheels. One of the heads was removed to allow the remaining head more travel.

A two-wheel tool grinder was attached to the head so that it could be fed up or down by the vertical slide. Since the brackets for the motor and driving drum were attached to the cross-rail, the wheels could be adjusted vertically but a small amount without making the belt too tight or too loose. Therefore, coarse adjustments were made by raising or lowering the cross-rail.

The regular planer motions and cross-feed were not interfered with and the work produced had a good finish.

The device was made and used in the Harrison, N. J., plant of the Worthington Pump and Machinery Corporation.

Facing Fixture for a Gear Box

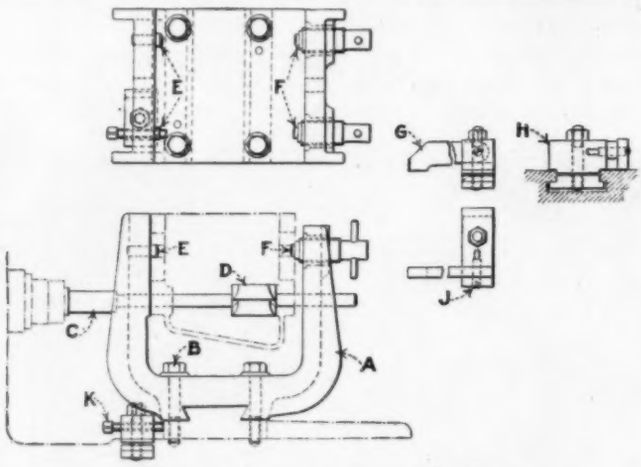
By S. A. White
Rugby, England

The fixture shown in the illustration was designed for machining the inside faces of bosses on a gear box for a light car.

The fixture was mounted on the saddle of a Drummond lathe and two fixed stops on the machine gave the required distance between the inside faces of the gear box.

The fixture comprises a body casting *A*, which is attached to the machine saddle by the screws *B*. The body is bored to suit the bar *C*, carrying the cutter *D*, the cutter being a push fit on the bar and held in position by a screw.

The gear box is located at the ends by the pins *E* and *F*, which are a push fit in corresponding holes of



Fixture for facing inner bosses

the component. The pins *F* are adjustable by means of threads on their shanks, and when screwed up the component is clamped between the shoulders on the two sets of pins.

The stop *G* in the block *H*, swings on the pin *J* and gives the position to which the fixture and saddle are to be brought to complete the facing at one side. The screw *K* is the stop against which the saddle is to be brought to complete the facing at the opposite side. Both stops are attached to the lathe bed. To remove the work, the stop *G* is swung over, and the machine saddle moved along, so as to clear the bar *C*.

The cutter is mounted on the bar after the component has been placed in position, and has to be pushed off when the operation has been completed, in order to unload the fixture.

Considering that but a small output was required, the first cost of the fixture had to be considered, so it was designed for cheapness and simplicity.

Welding a Pedestal Binder

By William Denton

One of the jobs that comes to the welding department of a railroad shop is the pedestal binder of a locomotive. This part is very simple in construction and apparently an easy piece to weld, but many a welder has been surprised at the persistency with which a binder that has been broken and welded will break again at the weld.

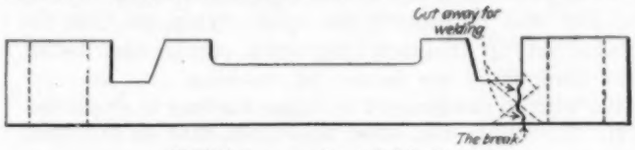
The manner of welding binders shown in the sketch herewith was conceived by Mr. Walker, foreman of the Rigby shops of the Maine Central R.R., and has been very successful and satisfactory. The electric arc is used, and the material is a standard steel welding-rod.

The binder almost invariably breaks at the corner of the notch that receives one of the pedestal jaws. Instead of making the usual kind of a weld the metal is cut away (in a shaper) as indicated by the dotted lines.

IDEAS FROM PRACTICAL MEN

The broken parts are then bolted to a heavy iron strap, kept for the purpose, and carefully gaged to bring the bearing faces to their original position.

Starting on the exposed side, the break is joined at the bottom of the V and built up to a depth of perhaps a quarter of an inch. It is then allowed to cool naturally, the operator meanwhile working on another job.



Welding a pedestal binder

When both work and strap are cold the bolts are taken out, the piece bolted to the strap the other side up and the other V filled to a somewhat greater depth than on the first side; after which the work and the strap are again allowed to cool.

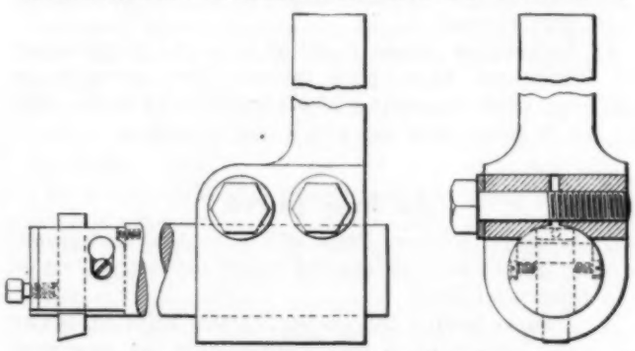
The strap is now discarded and the operator working continuously, fills first one side and then the other, a quarter-inch at a time, until the Vs are filled and the binder is restored to its original size and shape. Refitting the binder to the pedestal is rarely, if ever, necessary.

Extension Tool for the Planer

By Martin H. Ball

Though an extension tool on planer work is to be avoided whenever possible, there are occasional jobs, especially in small and medium sized shops, where the use of such a tool is imperative. To take care of such jobs as were too large to pass between the housings of our largest planer we designed the tool here shown.

The holder is a steel casting and the clamping bushings are made from cold-rolled bar. Washers and clamping screws are standard stock parts. The bars are made in various lengths and diameters, the sizes being in accordance with the length. Split bushings of gray iron adapt the smaller bars to the holder.



Extension tool for the planer

A swinging block, or clapper, is fitted to the end of each bar to hold the toolbit. It swings on a parallel pin passing htrough the bar, fitted tightly to the holes in the bar but free enough in the clapper to allow the latter to swing. The pin is prevented from working out by two small fillister-head screws.

It is best to make the bars as long as may ever be needed, for a bar may be adjusted in the holder so that only enough of its length to cover the job in hand projects in front of the holder, while the remainder extends back under the cross-rail where it is out of the way.

When using such a bar it is necessary to fasten the clapper of the planer so that it will not swing. Some planers are provided with an extra taper pin to pass through the box and clapper at the lower end. On other planers the object is accomplished by packing under the upper end of the holder before tightening the toolblock screws.

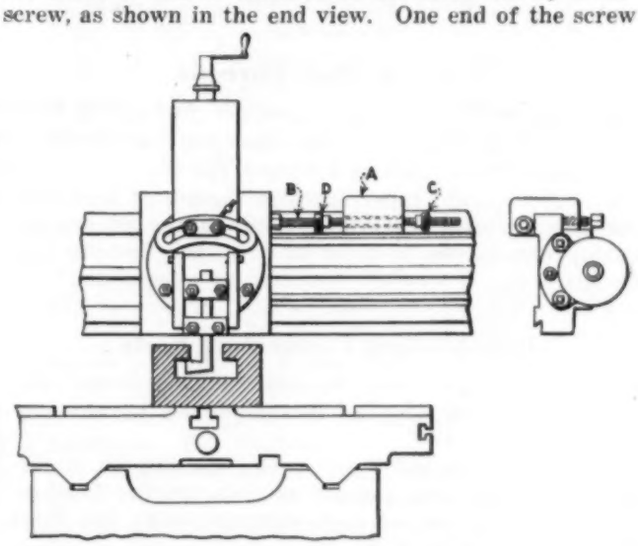
Stops For a Planer Saddle

By Hugh Humphrey

In planing T-slots, some sort of stops are useful to prevent the tool from being fed too far in either direction.

The illustration shows an arrangement of stops that can be cheaply made and easily applied to a planer.

The block *A* is drilled to allow the free passage of the screw *B* and is attached to the cross-rail by a setscrew, as shown in the end view. One end of the screw



Stops on a planer cross-rail

B is screwed into the saddle and held by a check nut. Knurled nuts *C* and *D* are placed on the screw, one on each side of the block *A*, and can be adjusted so as to stop the travel of the saddle in either direction and at any point desired. Nut *C*, when properly set, will prevent the tool being fed too far into the slot, while nut *D* will prevent the shank of the tool from gouging into the work when run out of the cut for the reverse stroke of the planer.

The department, "Ideas from Practical Men," is devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for at space rates.

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

Coating Lead Foil with Bronze

Q. Can you tell me where I can get either a formula or the materials for coating lead foil with gold bronze? The lead foil is 0.003-in. thick.

A. If you want to bronze only a few sheets of lead foil, you can paint them with bronze paint such as can be bought at any paint store. Instructions for applying the bronze come with the paint. If you want to bronze the foil in large quantities, you will require a bronzing machine.

Benefit of Correspondence Courses

Q. Do you think it is a reasonable proposition for a practical machinist to take a correspondence course in mechanical engineering, with a view of fitting himself for a foreman's position and eventually for something better?

A. Yes, by all means. A correspondence course in a good school is an excellent preparation for advancement.

Taper of Pipe Threads

Q. What is the standard taper per foot for a pipe thread of 1½ threads per inch? Does any manufacturer make pipe with a taper of ⅛ in. per foot?

A. The standard taper for pipe threads is ¾ in. per foot for all sizes. We have never heard of anyone making pipe having a taper of ⅛ in. per foot for the threads.

Rebabbitting Connecting Rods

Q. Can you give me the address of someone who makes a specialty of rebabbitting connecting rods for the Fordson tractor?

A. All the principal Ford service stations are equipped for rebabbitting connecting rods for the Fordson tractor. For a list of such stations, write the Ford Motor Co., Detroit, Mich.

Hardening Dies

Q. I have had considerable trouble in hardening dies by heating in the ordinary manner and quenching in oil. The dies are ¾-in. square and about 6-in. long. There is a hole 0.120 in. in diameter at one end. The steel from which they are made contains from 0.75 to 1.00 per cent carbon. Out of 150 dies hardened, 54 were cracked.

I tried heating the dies in molten cyanide of potassium at 1,600 deg. F. and have had none to crack.

Will you tell me what effect the cyanide bath has on the steel and why it prevents the dies from cracking?

A. Heating steel in molten potassium cyanide slightly increases the hardening qualities on the surface. However, in your case, the benefit derived from so heating the dies was in heating the steel evenly, so that the strains set up in quenching were evenly distributed, thus minimizing the danger of cracking.

We wish to caution you that the practice is an exceedingly dangerous one, since potassium cyanide is highly poisonous and the fumes given off when melted, are deadly.

Inasmuch as the steel you are using is high enough in carbon content to harden readily, we advise you to heat the dies either in molten lead, common table salt, or barium chloride.

Three Kinds of Finishes

Q. Will you kindly give us the definition of the following finishes: Planished, ground, and lapped?

A. A planished finish is one that is given to the material by passing it through highly polished rollers or dies.

A ground finish is one produced by grinding, and, as generally understood, would not approach a polish.

A lapped finish is produced by lapping with a lap of lead, or other soft metal, charged with an abrasive. A lapped finish may be anything from a ground finish to a polish, according to the fineness of the abrasive used.

Whitworth Pipe Threads

Q. What is the outside diameter of the Whitworth 1¾-in. pipe thread?

A. Authorities appear to differ as to the diameter of the Whitworth 1¾-in. pipe thread. One gives it as 2.047 in., while according to others it is 2.116 in. We are not in position to say which one is correct.

An Easy Curve

Q. Is there a curve that will ease the centrifugal force of a body as it enters and leaves the curve from or to a tangential line?

A. A curve having the properties you refer to, is one variously known as a spiral, transition, or easement curve.

You will find the theory of this curve and the formula for laying it out in "Allens Railroad Curves and Earthwork," published by our book department, McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York.

Cement for Fastening Celluloid to Wood

Q. What kind of glue or cement can I use to fasten thin celluloid to wood?

A. We believe that a good glue or cement such as is used in cementing the joints of leather belting will answer your purpose. You can get it from any dealer in belting.

Technical Abstracts

The Working of Duralumin

The German engineer Fritz Wittekind, claims there exists at the present time no light metal of strength properties equal to those of duralumin that could be produced without infringing on the German patent 244,554. (This patent is owned by the Duerener Metallwerke, A.M.G. in Dueren. This patent would then seem to cover among other things, the heat treatment by annealing and quenching, which is common for instance to duralumin and aludur. It does not cover composition.—Abstractor's Note.)

The melting point of duralumin is 650 deg. C. It has an electric conductivity equal to 35 per cent of that of pure copper and it is not attacked by mercury. Exposed to the weather, it is soon covered by a light gray film that protects it against further attack. Tests at the Testing Institute at Neubabelsberg have proved that the strength properties of duralumin are not impaired by exposure to temperatures even as low as that of liquid air. Even the impact resistance of the notched bar remained about the same, showing that cold does not make the material brittle. The tests were carried out after the test pieces had been previously heat-treated and aged for five days.

It is not advisable either to solder or weld duralumin as thereby temperatures of from 300 to 650 deg. C. are attained. These destroy the strength properties imparted by heat treatment. The material should be riveted. Duralumin should not be hot-worked at a temperature of 400 to 450 deg. C.

To remove hardness caused by cold working, the material should be annealed in a salt bath. No change in its properties occurs up to 170 deg. C., but at 180 deg. C. the strength and hardness begin to diminish and the greatest softness is attained at 350 deg. C. At a higher temperature the strength as well as the elongation and the hardness begin to increase again. A maximum is reached at 500 deg. C. Quenching from this—but under no circumstances from a higher temperature—leaves the metal in that state of combined high strength and ductility that has given it its value. The properties can be still improved by storing during five days.

After the storing an increased strength can be secured by cold working. This increase, however, involves a decreased ductility and especially a decreased flexibility. Heat-treated and cold-worked duralumin must, therefore, be bent to a sufficiently large radius, but not bent very sharply.

To give duralumin a silvery white appearance it is placed for five minutes in 10 per cent soda lye at 30 deg. C., is then washed in water, soaked in acid, and again rinsed in water.—*Illustriette Flugwoche*, Oct. 16. p. 290.

Hardness Numbers and Their Relation

A somewhat technical article by Dr. H. P. Hollnagel goes into the question of why hardness numbers such as those determined by the sclerescope and Brinell machines are not readily transferable to one another.

The predominant reason for this apparent impossibility is the lack of a real basis of comparison, there being no real unit of hardness. The true hardness of the most perfect type of crystalline material would be considered the pressure necessary to displace an atom from its position in the lattice (at a particular temperature). Since the force with which an atom is repelled by its neighbors is the true force of restitution and resistance, there exists a certain depth beyond which deformation will cease to occur because of the difficulty of penetration of one atom into another. Beyond this point rupture takes place by atoms shearing past each other under which condition true hardness has no significance. The article is illustrated with schematic representations of the pure crystalline state of metals.—*The Iron Age*, Nov. 27. p. 1404.

Test of Management

Charles Piez, chairman of the board of the Link-Belt Co., Chicago, gives an explanation and the results of his experience during thirty-five years with his company. The scheduled working day, so much time for planning, so much for dictation, so much for conferences, is very desirable for the subordinate executive whose duties are of a constantly recurring type, but such things are not desirable for the executive who must set a course for the business ship and hold the craft to it.

He has also found that seven or eight hours constitutes a reasonable working day for an executive charged with heavy responsibility. Chief executives are expected to direct others how to do the work.

No man can steer who cannot see the whole horizon, according to Mr. Piez. As soon as a task crops up that must be repeated again and again, it is time to pass it on to a man who can specialize on it and become expert. That is the test by which he has found it best to delegate work, and the experience of Mr. Piez has indicated that the larger the organization gets, the more the duties of the chief executive partake of a teaching or coaching character, combined with that of charting a course through the broad field of business.

All matters that give information as to the condition of the organization from the financial, marketing or production standpoint are brought to his desk, but modern management is built up on what may be termed, "the exception plan." The head of each department, while supervising routine operations has referred to him for decision everything out of the ordinary. The department head decides as many of these questions as he feels competent to do and passes the more difficult decisions on to his superior. The chief executive must hold himself free to take care of these exceptions and is in effect an emergency man and cannot be made a slave of a time-table.—*System*, January, p. 37.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Economy First

THE President minced no words in recommending economy to the heads of government departments at their recent business meeting. He pointed out the immediate necessity of reducing government payrolls by separating needless employees from them rather than by salary cuts. His popularity with bureaucratic Washington may suffer but his admonition will be music in the ear of the taxpayer.

In his address, Mr. Coolidge took occasion to emphasize the success of the Republican administration in reducing fiscal expenditures. From five and a half billion dollars in 1921 the annual expense has been cut to an estimated three and a half billions in 1925, a praiseworthy achievement, particularly in view of the fact that it has been accompanied by a reduction in the public debt of more than three billions.

That the people of the United States knew what they were doing when they elected Calvin Coolidge is indicated by his unequivocal statement that "Every dollar that is added by careful administration adds to the amount by which taxes may be reduced in the future." Congress may fuss and fume over petty affronts and unimportant details. The President has no time to bother with them; he is following a carefully prepared plan of economical administration and the results are decidedly successful.

Aviation on a Commercial Basis

THE "high spot" of the recent S.A.E. meeting in Detroit was the paper on all-metal airplanes by W. B. Stout. It was important in that it marked a turning-point in airplane construction. The company back of Mr. Stout expects to build planes at a price that will permit of their operation, on a profitable basis, in intercity passenger and express service.

To accomplish his purpose Mr. Stout has standardized his design around the Liberty engine and is building interchangeable units on metal jigs. Being made entirely of duralumin his plane is non-inflammable and the passenger cabin is so strongly protected that it should withstand anything but the most severe crash without serious injury to the passengers. Designed with two objects in view, maximum safety and lowest operating cost, there is good reason to believe that this plane will be successful as a money-making means of transportation.

The purchaser is permitted no latitude as to design details. If the design does not meet his requirements he must seek elsewhere. This plane sells "as is" on its merits and is thus a striking contrast to the usual built-to-order variety.

We look for great things from this enterprise and we believe the men back of it deserve universal support.

When Is Repetition Work Monotonous?

THERE seems to be an idea among many well-meaning people that all repetition work is monotonous and soul-killing. This idea is fostered by writers and orators who find the subject a good one to be treated in words that burn like fire or chill like ice, as the occasion may demand. It is therefore somewhat difficult to obtain a hearing for the man who deals in facts and observations instead of emotions and hot air. Such a man is apt to be called cold-blooded and lacking in sympathy for his fellow beings.

Nevertheless it is necessary sometimes to sit down and think calmly about the things that look wonderful or terrible to us when we feel more than we think. When we do this, it may occur to us that there are many things in life that are pure repetition and yet we breathe about 24 times a minute and keep it up 24 hours a day, every day, every year. And there are the steps we take when we walk a few miles; about 120 a minute, and hours at a time. And so on, and so on.

Why is it that walking does not seem monotonous repetition work? The answer is simply that we are so well equipped for this work that it becomes automatic and does not interfere with our mental processes; we are in harmony with it.

Any work which is so easily performed that the operator becomes unaware of the fact that he is doing it can be kept up for a long time without undue fatigue and does not prevent him from thinking or even dreaming at the same time. It is also true that many people with active minds find relaxation in repetition work, possibly because in doing so the needs of mind and body are met simultaneously.

Repetition work becomes soul-killing when it is out of harmony with the performer; the strong six-footer gaging steel balls; the frail girl standing all day on her feet and lifting things up and down; the sluggish, heavily built man making rapid movements; the nervous person doing slow work.

The tragedy of the work is not caused by its repetition but by the mismating of work and worker.

Shop Equipment News

Warner & Swasey Roto Pneumatic Grinder

A pneumatic grinder that operates on the rotary principle and that contains only three moving parts has been developed by the Warner & Swasey Co., Cleveland, Ohio. It is intended for grinding, wire brushing, buffing and polishing at high speeds.

The machine, as illustrated in Fig. 1, is equipped with a straight handle, but a spade handle can be furnished if desired. The principle of operation is indicated in Fig. 2 which shows the grinder in cross-section and also two positions of the rotor in relation to the ports.

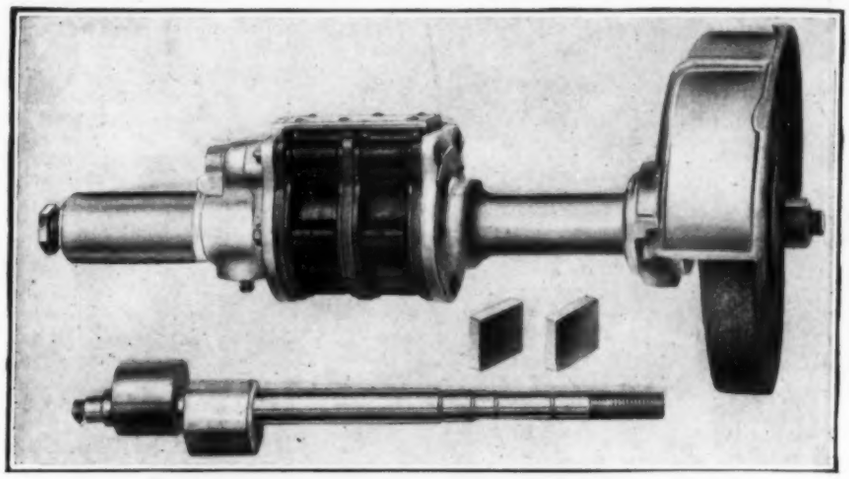


Fig. 1—Warner and Swasey Roto Pneumatic Grinder

A part of the air entering at *A* will get into the space back of the valve *B* and will hold *B* against the eccentric *R*, in any position of the machine and seal all direct connection between *A* and the exhaust ports *X*.

The main air flow is into the cylinder *C* exerting pressure against *R* causing it to turn in the direction indicated, until it has reached the position shown in cross-section No. 2, where *A* is sealed off and the air in the cylinder exhausts through *X*, the several exhaust ports.

There are two eccentrics *R*, each rotating in its respective cylinder, mounted opposite each other to give a balanced effect and an overlapping power impulse to the shaft.

Replacement of the only wearing parts, the two micarta valve blades, can be made after removing the cover plate *D* which is a minor operation. There is a clearance of 0.002-in. between the chrome-nickel steel shaft and the aluminum cylinder housing which is sealed by oil introduced from a reservoir in the handle.

This reservoir, shown in cross-section No. 3, contains enough oil for a day's run by controlling the flow into the main air inlet with the needle valve provided for this purpose.

Pressures can vary between 65 and 90 lb., and the corresponding air consumption will be 32 to 40 ft. per minute. This amount will remain constant (even after a term of use) on account of the construction.

Speeds are ranged from 3,500 to 7,000 r.p.m. depending on the work to be done. Weights are 8½ lb. on the small size which carries a 6-x 1-in. wheel and 15 lb. on the other two in the line which mount respectively an 8-x1-in. grinding wheel and an 8-x3-in. aluminum buffing wheel.

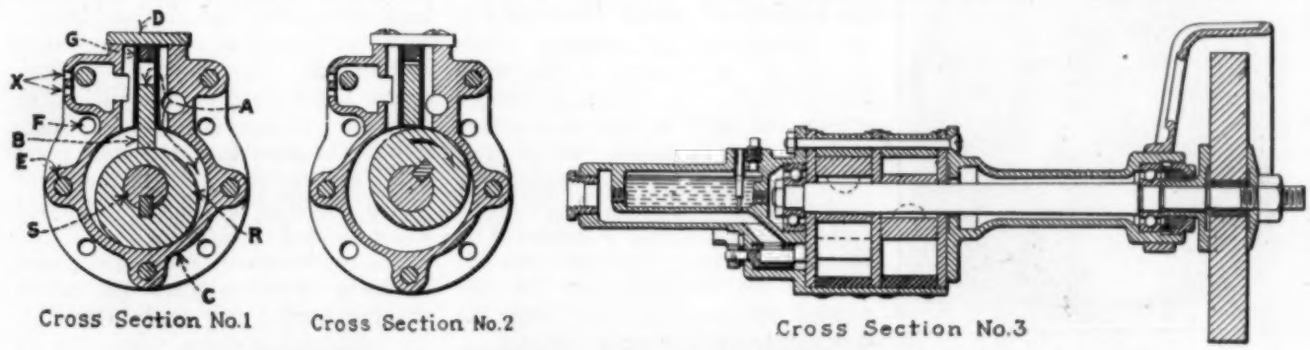


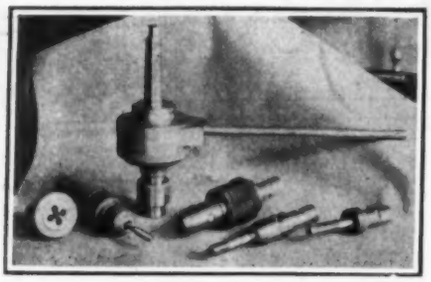
Fig. 2—Cross-sections through the Roto grinder indicating the construction and operation

Procunier Style J Tapping Attachment and Stud Setter

William L. Procunier, 18 S. Clinton St., Chicago, Ill., has increased the range of usefulness of his line of quick-change chucks and attachments by developing his tapping attachment so the quick-change chuck system can be used in connection with it. He has also added a quick-change stud setter that can be furnished with the positive or the friction drive.

Tools are changed while the tapping attachment is in motion, in the usual manner, by lifting the loose

SHOP EQUIPMENT NEWS



Procunier Tapping Attachment and Stud Setter

collar which releases the driving balls and allows the tool to drop free.

Studs are not loosened after driving, when the attachment is made to reverse the stud setter, as the first instant of reverse motion allows the driving pin to move up inclined slots in the body of the driver and release all pressure on the end of the stud.

There are four sizes that range from the smallest to a $\frac{3}{8}$ in. tap as the maximum.

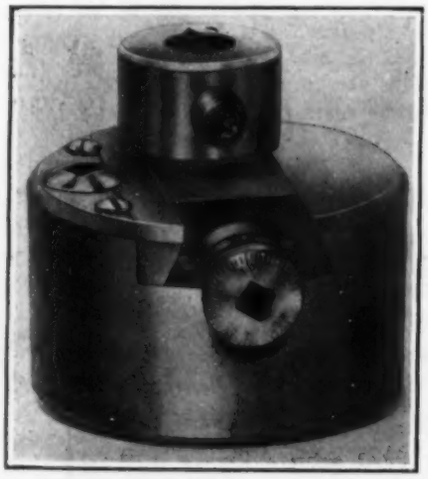
Detroit Offset Boring Chuck

The Detroit Pattern Works of the Sommers Industries, 534 East Fort St., Detroit, Mich., has developed and is producing the offset boring chuck illustrated.

The chuck is adapted to accurate boring operations on account of the fineness with which its cross-slide adjusting screw is graduated and the rigidity of the toolholder in the slide when it is clamped in position. The same pin wrench is used for both adjustment and clamping.

The toolholder will take round, square, or hexagonal stock up to $\frac{3}{4}$ in. inclusive, and can be set on center or a maximum of 2 in. off center. In the extreme position the holder center will describe a circle 4 in. in diameter without sacrifice to rigidity.

The body, which is bored for a No. 4 Morse taper shank, is 4 in. in diameter and with the toolholder is $3\frac{1}{2}$ in. over all.



Detroit Offset Boring Chuck

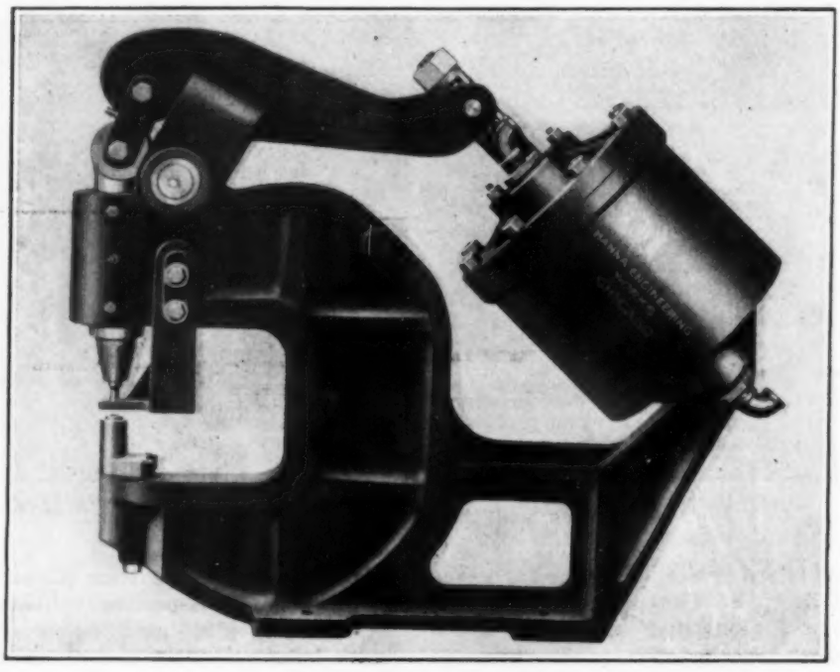
Hanna Combination Riveter and Punch

The Hanna Engineering Works, Chicago, Ill., has added to its line of pneumatic riveting machines and is now marketing the combination riveter and punch, illustrated in the accompanying half tone.

The machine can be used either as a stationary or portable tool, with the dies occupying various positions. Thus if used as a stationary tool, it can be mounted on the cast feet as shown, with dies in a vertical position, the working die being above. This is the most usual set-up for punching operations, and for riveting, when rivets can be entered in the work from below. By using a special cradle, the machine can be inverted with the working die below. The machine may be also mounted horizontally on a wall or, by using a suitable cradle, it may be mounted on the floor in the same position. If desired the machine can be suspended for portable use with the dies either vertical or horizontal.

The machine is able to reach work in remote corners and angles, as is often the case in the automotive industry. It can also be used in the sheet-metal industry for light riveting and punch work, and can be equipped with various special tools, as for example, for crimping wire or upsetting.

The piston has its inertia absorbed at the extremes of the stroke by air cushions. This is essential to the use of the machine as a punch.



Hanna Combination Riveter and Punch

The mechanism is a combination of single lever and toggle, giving a long die-stroke and a considerable zone of uniform pressure, thus eliminating the necessity of a screw adjustment on the die. The first part of the die-stroke is very rapid. The speed then decreases gradually, and for the last few inches of piston travel is considerably reduced and practically uniform.

The combination riveter and punch is made in three sizes for rivets varying from $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. The machine weighs from 300 to 625 lb., according to size.

News of the Week

Industrial Marketing Is Discussed at McGraw-Hill Convention

Herbert Hoover sends message of approval to sales conference

Economic marketing in industry, with particular stress laid on the help industrial and business papers may give in cutting the corners of waste in sales and distribution, was the general topic of discussion in a three-day convention of the business and editorial representatives of the fifteen publications of the McGraw-Hill Co. which closed Friday night, Jan. 30, with a dinner in the Hotel Pennsylvania, New York. Reading of a letter from Herbert Hoover, Secretary of Commerce, in which that cabinet official stressed the importance of the industrial and business publications as leaders in economic and industrial thought, was one feature of the banquet. Julius H. Barnes, past-president of the Chamber of Commerce of the United States; Fred I. Kent, vice-president of the Bankers Trust Co., New York; David Sarnoff, vice-president and general manager of the Radio Corporation of America, and Fred M. Feiker, vice-president of the Society for Electrical Development, were the guest speakers.

PROMINENT SPEAKERS AT SESSIONS

Outstanding American industrialists took part in the sessions of the convention itself. Their talks followed closely the lines laid down for discussion and each speaker stressed important phases of the effort of the McGraw-Hill Co. to develop to the maximum its program of help to industry in promoting economic and efficient selling and distribution methods. Facts brought out in the company's nationwide survey of the buying habits of industry were brought out repeatedly in the convention and round table group discussions.

In the first session of the convention, which opened Wednesday morning, Jan. 28, W. L. Batt, president of the SKF Industries, Inc., and P. L. Thompson, advertising director of the Western Electric Co. and a past-president of the Association of National Advertisers, were important industrialists who spoke. Mr. Batt, who had the subject "Creative Selling," made clear, among other things, the definite need industry has for help, information and guidance from the industrial and business press. Mr. Thompson, who had as his subject "The Publisher's Representative from a Buyer's Point of View," showed the importance of co-operative effort between the publication and the advertiser, so that the advertiser will realize to the fullest extent benefit from the broad knowledge of industrial fields possessed by the industrial and business paper.

The keynote of the convention was struck in the letter from Mr. Hoover, which was read by Mr. Feiker. "I wanted to attend your convention," said the letter addressed to James H. McGraw, president of the McGraw-Hill Co., "to say a personal word of appreciation for the fine service which you, your company and your publications are rendering to American industry. It is a real disappointment to me that I cannot come.

SCIENTIFIC DETERMINATION

"A big change has come in the spirit of American business and for this change you are in part responsible. I mean the change from rule of thumb and *laissez-faire* to scientific determination of facts and programs of action based on facts. The business press is probably the greatest force in making industrial opinion. The schools and colleges have an important place, the trade associations can do much in the fields of production and distribution, the Government bureaus that keep in contact with business can help to promote sound leadership in industrial and economic thinking. All have an important place, but the business press and technical journals are in a unique position and have a unique opportunity. I believe that no organization of technical publications has come nearer to living up to this opportunity than the McGraw-Hill publications under the leadership of James H. McGraw.

"The thought that I have in mind is that your great group of journals cannot only recognize and support sound industrial leadership; you can also initiate it. The field of your opportunity is practically limitless."

Brazil Buying Machines from Germany

Brazil has been an attractive market for German machinery for the last few years, although less German machine equipment is being sold there than before the war says *Commerce Reports*, published by the Department of Commerce. German exports of machinery to Brazil have been steadily growing, the most outstanding increase being in exports of textile machinery, excavators, and elevators.

That Brazil is one of Germany's best machinery markets is attributable to the large settlements of Germans, in southern Brazil, who purchase German manufactures whenever possible. Germany's exports of the principal classes of machinery to Brazil, according to official statistics, aggregated 7,322 metric tons in 1913, 4,763 tons in 1922, 5,239 tons in 1923, and 6,193 tons during the first 10 months of 1924.

Auto Show Presages Better Buying

Reports from the Chicago Automobile Show received by the *New York Evening Post*, are encouraging to industry. The Chicago show was expected to furnish an indication of the amount of business to be expected in the agricultural states as a result of the bettered condition of the farmer. Indications are that farmers will be in the market for cars on a larger scale than has prevailed the last few years, but no overwhelming rush is anticipated.

Manufacturers are holding to their determination to be guided in production by the number of cars sold by dealers. Instead of stocking cars on a large scale to meet hoped-for future demand, most makers are holding production to what distributors want at this time. The result of this policy affords a great contrast to what prevailed last year.

CONSERVATIVE SCHEDULES

A year ago every manufacturer seemed intent upon hanging up new production records. The cars were piled upon the distributors and dealers until the latter were forced to cry for mercy. This year most manufacturers are proceeding so cautiously that to many who remember last year the industry seems to be at low ebb.

This situation has given rise to many rumors of an unfavorable nature about this and that company. Most of the rumors are without foundation. This is the slowest period of the year for sale of automobiles. As a result of the effort of manufacturers to be guided in production by sales, it therefore follows that production is likewise on a relatively small scale for most makers.

Present operations, therefore, cannot be used as an index to the automobile business to be expected this year. Production should be on an increasingly greater scale as spring approaches. The manufacturers insist that there is every reason to believe that satisfactory business is assured. The answer as to the correctness of that view should be manifest within the next few months.

The seasonal buying period is usually considered to be during the months of April, May and June.

American Management Association Holds Annual Meeting in New York

Many speakers of prominence discuss a variety of subjects

The annual convention of the American Management Association was held Jan. 28, 29 and 30 at the Hotel Astor, New York City, and was attended by approximately four hundred executives from all parts of the United States. Excellent papers and an unusual interest in the group meetings characterized the three days of sessions. Most of the speeches, discussions and group meetings were held strictly to schedule and those attending expressed satisfaction over the manner in which the convention was conducted.

Sam A. Lewisohn, vice-president and treasurer of the Miami Copper Co., and Acheson Smith, vice-president and general manager of the Acheson Graphite Co. were the first two speakers on Wednesday morning. Mr. Lewisohn delivered the presidential address, while Mr. Smith presided at this session. This was followed by the report of W. D. Stearns of the works department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, who was the chairman of the committee on supervisory forces. Mr. Stearns embodied his report in a clearly outlined speech entitled "Measuring and Grading the Supervisory Forces."

At 11:30 o'clock group meetings were commenced in which the speech of Mr. Stearns was discussed and applied to the following groups: in the office, in the retail organization, in the factory, and in the field sales organization.

Luncheon was served at 12:45 o'clock and in the afternoon two divisions held meetings. In the North Ball Room, Dr. R. S. Quinby, service manager of the Hood Rubber Co. and chairman of the committee of health supervision spoke on "A Health Supervision Manual"; W. H. Winans, manager of the industrial relations department of the Union Carbide Co., presided at this meeting.

The Army and Business

In the east ball room the topic discussed was "What Can Business Learn from Modern Army Organization?" and two views were presented. "Army and Corporate Business Compared," was the subject of Col. R. I. Rees, assistant vice-president of the American Telephone and Telegraph Co. and "Leadership and Discipline," was the topic of Col. Steever, supervisor of industrial relations of the General Electric Co.

Sterling Patterson, editor of the *Western Electric News*, delivered an address later in the afternoon in which he told, "What Should Be Run in an Employee Magazine."

In the evening apprenticeship was taken up from several different angles and thoroughly discussed. At this session C. S. Coler, manager of the educational department of the Westinghouse Electric & Manufacturing Co. presided and the speakers heard were: A. B. Gibson, manager of the Westinghouse Technical Night School; Franklin T. Jones, superintendent of training at the White Motor Co.; H. A. Frommelt, apprentice superintendent of the Falk Corp., and several others.

Methods of employing help in different factories were the subjects that occupied the opening session on Thursday morning. Like Wednesday morning's session, it was followed by group meetings for separate consideration and discussion.

Lunchrooms and College Graduates Discussed

Employees' lunchrooms, co-operation and the college graduate were the topics considered at the afternoon session. Group meetings took up and discussed the lunchroom proposition. Other group meetings followed these considering the question of essential personnel records.

In the evening the annual dinner was held with the following speakers scheduled: T. P. Sylvan, vice-president of the New York Telephone Co.; Bernard L. Shientag, Judge of the Municipal Court of the City of New York; and Lucius R. Eastman, president of the Hills Brothers Co., and also president of the Merchants' Association of New York.

Friday's sessions were given over to group meetings that discussed the following subjects: "Training;" "Man-Job Analysis"; "The Economist as an Aid to Management"; "Payroll Administration"; and "Timekeeping—a Technical Study."

Will Reduce Variety of Saw Blades

Hack saw blades are about to be simplified as to variety as a result of studies conducted for some months by the manufacturers with the co-operation of the Division of Simplified Practice, the Department of Commerce. The tentative plans which will be put into effect July 1, call for the retention of 41 sizes, and the elimination of 245 sizes which were shown to have a demand of less than one one-hundredth of one per cent. The further elimination of 50 sizes ordinarily cataloged but not made is also provided.

Nineteen Sizes Retained

In the field of blades for hand-operated hack saws, 19 sizes are retained and 69 eliminated, together with 16 dimensional items carried only in catalogs. And the program for this group would eliminate all numbers having 16, 20, 22 or 28 teeth to the inch, it being claimed that the combinations retained —14, 18, 24 and 32—would serve all purposes.

The survey was undertaken following a meeting held in Washington last May.

The simplification is one that holds a promise of far reaching effects, the Division of Simplified Practice reports, as makers of hack saws and hack saw blades in other countries have been watching with keen interest the progress made in this country.

A. E. Culley of the Simonds File Co., Fitchburg, Mass., is chairman of the simplification committee of the industry.

Schenectady Denies Distress Story

Business conditions in Schenectady do not warrant reports of widespread unemployment and distress. Only 200 men have applied to the city for relief, many of them from out of town, a smaller number than usual in an industrial city of 100,000 at this time of the year. Banks report an increase in savings accounts of nearly $5,000,000 during the past year.

The following statement was issued by the General Electric Co., the American Locomotive Co., the two largest employees of labor in the city, and the Chamber of Commerce:

"The low point in the business depression, as affecting Schenectady, was reached several months ago, and improvement in all lines has been steady since then. Business in Schenectady this year was much better than in many other industrial centers.

"The General Electric Co. in Schenectady laid off about 5 per cent of its 22,000 employees some months ago, but to prevent this layoff from causing distress over $1,000,000 was appropriated for the manufacture of stock parts at this plant, which is keeping many workers at least on part time. In recent weeks an improvement in business has resulted in some re-employment and many on part time have been put on full time.

"During the last three months the American Locomotive Co. operated nearly at capacity in its Schenectady plant, more than 3,600 being now on its payroll."

American Farm Machinery in Belgium

American agricultural machinery is very popular in Belgium and is generally preferred to European makes except for certain types of specialized machinery for which European countries have gained a solid reputation, according to report to the Department of Commerce by Assistant Trade Commissioner Hunt, Brussels. Competition from European countries has been increasing, but American manufacturers have held their ground. Mowers, reapers and binders, and tractors of American manufacture are so firmly established in Belgium that European manufacturers find it extremely difficult to compete against them.

Severe German competition is considered as a certainty for the future, but up to the present the Germans have made little headway in Belgium and the well-established dealers do not greatly fear this future competition. Belgian farmers are prosperous enough to require very little credit, and local agents are usually able to meet demands for credit by farmers without the aid of their principals, so that the long-term credits are not considered an inducement.

France Increases Its Machinery Buying From United States in 1924

Machine tool demand continues to gain over two-year period

Sales of American industrial machinery to France during the first nine months of 1924 amounted to $4,329,407, and showed a gain of about 10 per cent over the figures of the corresponding period of 1923, when they reached $3,936,240, according to the Industrial Machinery Division of the Department of Commerce. An increase of 43 per cent occurred in shipments of power-generating machinery (omitting electric) and a gain of approximately 70 per cent in exports of metal-working machinery, when these classifications totaled $309,135 and $1,291,744, respectively, for the period in question. These increases more than off-set declines in exports of construction and conveying equipment, mining, oil-well, and pumping machinery, and textile, sewing and shoe machinery.

France ranked seventh as a market for American machinery among the countries of the world in 1910, 1913, 1921, and in 1923. In 1919, France stood in second position, absorbing more than $38,850,000 worth of industrial machinery from the United States and outranking the United Kingdom, Japan, and Cuba during that year. In 1922, France stood in eighth place, purchasing American machinery valued at $4,715,561 which increased to $5,345,461 in 1923—a gain of about 13 per cent. French purchases of industrial machinery from the United States in 1923 amounted to over $1,000,000 more than that exported to either British India or Argentine.

The leading factor in the increase of 43 per cent in American exports of power-generating machinery to France during the first nine months of 1924 was a decided gain in shipments of steam engine accessories and parts. France purchased $14,868 worth of this equipment in 1922, $199,719 in 1923, and $214,268 worth during the nine-month period in 1924. Parts and accessories for internal combustion engines exported from the United States to France increased about 25 per cent in value during this period. Exports of power-generating machinery as a whole (omitting electric) increased from $215,988 for the first nine months of 1923 to $309,135 for corresponding months of last year.

Construction Machinery Exports Decline

Exports of construction and conveying machinery as a whole declined slightly during the first nine months of 1924, showing a falling off in the demand for American equipment of these types as a whole. Exports of steam and other power shovels to France, however, have increased steadily during 1923 and 1924. In 1922, the United States exported power shovels valued at $32,050 to France, in 1923, $39,960, and during the first nine months of 1924, $43,500 worth. Exports of hoists and derricks except mining also increased during the latter period.

Exports of practically all items of machine tools showed decided increases during the period from January through September of last year in comparison with corresponding months of 1923. Exports of lathes increased about 300 per cent, exports of gear cutters 300 per cent, and exports of sharpening and grinding machinery from $105,375 in value to over $345,000. French purchases of milling machines gained from $14,461 in 1923 to $69,505 during the nine month period of 1924. Exports of metal-working machinery increased from $760,744 to $1,291,744.

Exports of wood-working machinery, other than saw-mill equipment, declined from $37,069 in 1922 to $11,036 in value in 1923. Figures for the first nine months of 1924 indicate a recovery in the market for this machinery—$26,582 worth. Exports of air compressors increased from $232,517 during the first nine months of 1923 to $266,086 worth during corresponding months in 1924. Exports of paper and pulp mill machinery increased from practically nothing in 1923 to $198,889 in value during the first nine months of 1924.

Eastern Railroads Report Increases

December railroad reports as published recently indicated a general improvement compared with the same month a year ago. The net operating revenue for the month on the New York Central Lines was 86 per cent greater than a year ago, while the Baltimore & Ohio reported an increase of some 367 per cent in its operating revenue for the month. In this connection, though, it was pointed out that the net of the Baltimore & Ohio a year ago was much below normal.

Gross business of the New York Central for the month was $31,718,848, compared with $31,933,654, and the net operating income $5,509,824, compared with $2,944,876. For the twelve months' period the New York Central reported gross of $369,940,387, compared with $421,034,183, and railway operating income of $64,926,937, compared with $70,989,101 for 1923.

The Baltimore & Ohio showed an increase in gross for December compared with a year ago, the total being $18,215,159, against $17,075,254. By keeping railway operating expenses more than a million dollars below the same month of last year the road was able to report net operating income of $2,929,469, against $603,695. Twelve months' figures on the Baltimore & Ohio show gross business of $224,318,795, compared with $255,594,435, and net operating revenue of $38,084,324, against $42,133,130 for 1923.

There were exceptions to the roads which showed better figures for December than in the previous year. Among the larger of these lines were the Pennsylvania and the Union Pacific. For the month the gross business of the Pennsylvania was $52,773,237, or $1,994,325 less than a year ago, and the net railway operating income $5,654,819, or a decrease of $3,030,800, compared with December, 1923. Gross income on the Pennsylvania R.R. for 1924 was $645,299,176, a decrease of $76,098,232, while the net railway operating income was $79,103,112, or $4,443,555 less than for 1923. The twelve months' report of the Pennsylvania shows that that company saved $73,067,357 on its operating expenses during the year.

Net income on the Union Pacific for December was $2,932,971, against $3,022,967 in 1923. Gross business of the Union Pacific for the year was $199,035,117, compared with $211,318,465 the previous year, and the net income was $37,913,161, against $39,660,245.

Electric Companies in Strong Positions

Bookings of the larger manufacturers of miscellaneous electrical equipment have recently been expanding. The combined sales of the General Electric and Westinghouse companies in 1924 showed a smaller decline than had been expected. Sales were about $432,000,000, compared with $467,000,000 in 1923, a net decrease of 7½ per cent., whereas the decrease in the first half of 1924 amounted to nearly 12 per cent.

Electrical trade authorities believe that the slump of last year has ended, and they are looking forward to a furtherance of the gains in the demand for electrical equipment that took place in the last three or four months of 1924.

Western Electric sales in 1924 reached the record total of about $300,000,000, compared with the previous record in 1923 of $255,000,000, but this company manufactures principally telephone equipment. It is predicted that sales of telephone equipment will be somewhat below those of last year, because of the great strides made in the last five years by the telephone industry to catch up on delayed construction work. On the other hand, it is easy to account for the dropping off in the general electrical trade in 1924 by reason of the general industrial slump. Now that industry of all kinds is making steady gains, the demand for central-station power equipment and other electrical merchandise is expected to share in the movement. There has been no check to the demand for household electrics or for certain other phases of the domestic business.

Grand Trunk R. R. Buys Locomotives

The Grand Trunk Western R.R. has ordered for delivery at Battle Creek, eight 170-ton mountain type passenger locomotives for use on the International Limited, fast train between Montreal and Chicago. The locomotives will be built to haul 15 passenger coaches. They will have 90½-ft. wheelbase and cost $90,000 each. The order was placed with Baldwin Locomotive Works for delivery so that the new service, which cuts several hours from running time, may go into effect April 1.

Personals

W. T. OMWAKE has been elected chairman of the board of directors of the Landis Tool Co., Waynesboro, Pa.

ARTHUR E. PARSONS has been elected a director of the H. H. Franklin Manufacturing Co., Syracuse, N. Y., succeeding JOHN WILKINSON, resigned.

J. CARLSON has resigned as general superintendent of the Hanson-Whitney Machine Co., Hartford, Conn.

J. ELMER FRANTZ has been elected president of the Landis Tool Co., Waynesboro, Pa.

E. J. KULAS, president of the Midland Steel Products Co., formerly president of the Parish & Bingham Co., has been elected president of the Otis Steel Co., to succeed George Bartol, who has resigned. In recent years Mr. Kulas also has been associated in an executive capacity with the General Electric Co., the National Electric Light Co., the Peerless Motor Car Co., and other concerns.

A. F. JENKINS has been appointed assistant general sales manager of the Flint Motor Co., Flint, Mich

ROBERT D. MCCOLL succeeds JOHN R. MAGARVEY as manager of the Schenectady plant of the American Locomotive Co.

RUSSELL F. KLEINMAN has been appointed sales representative for the Philadelphia district by the Scott Valve Manufacturing Co., Detroit Mich. His headquarters will be in the Land Title Building and he will handle the complete line in eastern Pennsylvania, southern New Jersey, Maryland, Delaware and the District of Columbia.

ROY GILL has been added to the sales organization of the Blodgett Engineering and Tool Co., Detroit Mich.

JOHN R. MAGARVEY has been made consulting vice-president of the American Locomotive Co., Schenectady, N. Y.

L. A. OSBORNE, president of the Westinghouse International Co., will sail on the Berengaria Feb. 7. He will visit France and Italy.

F. E. MCWHIRTER, formerly general manager of L. M. Hergesbaugh & Co., Flint, Mich., has been appointed sales manager of the Wolverine Bumper Co., Grand Rapids, Mich.

FRANK E. WITT has been named general sales manager of the Flint Motor Co., Flint, Mich., succeeding THEODORE S. JOHNSTON, resigned.

JOHN M. WEBSTER of Somerville, Mass., has purchased with others the bankrupt Davis & Farnum Manufacturing Co., Waltham, Mass., that has been reorganized under the name of the Davis & Farnum Engineering Works, Inc. The new company is already engaged in the manufacture of iron and steel castings and steel plate work.

JOHN B. MOSS, assistant district manager of the American Steel & Wire Co., for the New Haven, Conn., and Worcester, Mass., districts, has tendered his resignation to take effect immediately.

Obituaries

ADOLPH E. BRION, chairman of the board of directors and former president of Peter A. Frasse & Co. Inc., New York City, and founder of the Frasse Steel Works, Hartford, Conn., died Sunday, Jan. 25. Mr. Brion's personal attributes and long association of almost half a century with this company had made him well known in

Adolph E. Brion

steel circles. In 1878 he came to Peter A. Frasse & Co. in a minor capacity, but his progressiveness and ability were early recognized and won frequent advancement until he became an important and dominant factor in the affairs of that company. In 1901 he was elected president of the company and during his administration rapid expansion occurred. In September, 1924, he resigned as president because of the unsatisfactory condition of his health and was elected chairman of the board of directors. The personal interest that Mr. Brion always showed in the individual welfare of his associates and employees has strongly endeared him in the hearts of those who have served under his management. Mr. Brion was born March 19, 1863 at Brooklyn, N. Y. He was a member of the American Iron and Steel Institute, and the Society of Automotive Engineers.

DR. NATHANIEL SHEPARD KEITH, aged 86 years, died recently at his home in Philadelphia. Dr. Keith was well known for his research work in the electro-metallurgy field and was the founder and first editor of *Electrical World*. He was the author of many books and was a member of the American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers, the American Electro-Chemical Society, and the Engineers Club of Philadelphia. He was on the advisory staff of Thomas A. Edison for many years.

LEROY FOREST BROWN, formerly with the Pope Manufacturing Co., and the International Harvester Co., died at his home, West Hartford, Conn., recently.

LYNN B. EASTON, aged 40 years, general manager of the Elmwood, Ohio, plant of the Worthington Pump & Machinery Corporation, died recently in a hospital at Cincinnati, Ohio.

SIR GUILFORD MOLESWORTH, aged 97 years, died recently in London, England. He was the author of a handbook of engineering formulas published in 1862 and was also well known as an engineer with excellent work on the railways in India to his credit.

Business Items

Henry Disston & Sons, Inc., saw and tool makers, have bought the two-story building at 111 North Jefferson Street, Chicago, directly in the rear and across the alley from their present site. The building is needed to take care of increased production.

The International Harvester Co., Chicago, has employed a special staff of engineers with a view to developing the motor coach branch of its business. Should the company go into the manufacture of these vehicles extensively, as is expected, the great facilities it commands will make it a big factor in that particular field.

The Rich Tool Co., Chicago, has changed its name to Carmor Metal Products Co.

The interests that organized the Great Lakes Drop Forging Co. last year, with a factory in Ecorse, just outside Detroit, have acquired the properties and business of the Detroit Forging Co. The latter has for many years operated a plant on Mt. Elliott Ave. on the East side of Detroit, that was organized 20 years ago by the late Hugo Scherer.

The Dean Hill Pump Co. has been incorporated at Anderson, Ind., with a capital stock of $300,000 for the purpose of manufacturing pumps and other machinery. The incorporators are Sylvester Johnson, Jr., Noble Dean, Stuart Dean, Edward P. Dean and Ferris T. Taylor.

The Charles H. Tinker Co., Boston, Mass., has been appointed New England representative for the Scott Valve Manufacturing Co., Detroit, Mich.

The Chicago Pneumatic Tool Co., New York, has opened a branch office in Mexico at Aparatdo, 695 San Juan de Letran, 15 Mexico, D. F.

New Metal Airplane Developed

A new type of American metal airplane, the Loening Amphibian, that has been secretly under development for over a year, made its first public appearance recently at Bolling Field. The first one, of an order of ten being built for the Army Air Service, was delivered by air to Washington, piloted by Lieut. Wendell H. Brookley, who flew the machine from the contractor's factory on the East River, New York City, to Mitchell Field. From there he made the cross-country trip to Bolling Field. This was the first cross-country flight ever made by an amphibian flying boat in this country. Lieut. Brookley's trip was without incident and he reported that the new craft handled well in every way.

Aviation experts have been awaiting with interest the demonstration of the Loening Amphibian, as it represents a very daring and novel metal design. For the first time in the development of the art, the ordinary tractor type of biplane has been modified, so that the machine is capable of landing on either land or water, with ability to start from or alight on either, at a moment's notice. No extra floats or other devices are used, as the new design obtains its amphibious characteristics by the shape of the main fuselage body itself, the bottom of which is shaped like a flying boat hull. To this is attached a folding landing gear, an ingenious device, which is operated by an electric motor,—the pilot merely throwing a switch in order to raise the wheels for water landing, or to lower them for alighting on the land.

As already demonstrated in flight, the new Loening Amphibian, in performance of speed and maneuverability, compares favorably with other airplanes of the same weight equipped with Liberty motors, such as the DH. But the deeper metal body and the unit construction give it a strength and rigidity which should greatly increase the safety of the crew in case of accident. In the sand test, conducted by the Air Service at Dayton, this body stood up without failure, to a load of three or four times what is customarily applied.

INTERIOR CONSTRUCTION

In addition to the metal covering of the entire hull and body, the interior construction of the wings is largely metal, duralumin being used.

One of the most interesting features of the machine is the use of the inverted Liberty motor. This development places the bulk of the engine cylinders, etc., below the line of thrust of the propeller, so that clearance for the propeller is more readily obtained, and at the same time, the center of gravity of the weight is lowered several feet.

The Loening Amphibian weighs 3,300 lb. empty and 4,000 lb. loaded. It has seats for a crew of three and a gas capacity of 140 gal., sufficient for a non-stop flight of 700 miles. A greatly increased gas capacity may be installed as there is ample room in the deep body.

An interesting feature of the machine is that the forward projection of the boat shaped body protects the propeller if landings have to be made in thick wheat fields or bushes, and preventing the machine from so readily turning over on its nose when hitting obstacles. This is also considered a greatly added safety feature in the design.

December Machinery Exports

Imports and exports of metal-working machinery during December, with revised comparative figures for December, 1923, as compiled by the Department of Commerce, are as follows:

	DEC., 1923	DEC., 1924
Lathes	$82,535	$95,727
Boring and drilling machines	56,771	83,227
Planers, shapers and slotters	3,962	30,758
Bending and power presses	25,970	157,552
Gear cutters	33,336	14,879
Milling machines	33,897	112,166
Thread cutting and screw machines	62,725	64,173
Punching and shearing machines	9,061	4,111
Power hammers	10,645	13,443
Rolling machines	12,000	.....
Sharpening and grinding machines	37,807	.....
External grinding machines	.....	133,589
Internal grinding machines	.....	24,427
Other grinding and sharpening machinery	.....	33,093
Chucks for machine tools	25,389	20,573
Reamers, cutters, drills, taps, and other metal-working tools	142,013	153,386
Pneumatic portable tools	73,467	75,898
Foundry and molding equipment	24,641	38,845
Other metal-working machinery and parts of	318,792	306,013
Total	$953,011	$1,365,860

Railroads Show Gain in December

Gross operating revenues of the 69 roads so far reporting for December aggregate $442,885,000 against $431,611,000 in December, 1923, an increase of $11,274,000 or 2.6 per cent. Considering these carriers in 1923 earned over 87 per cent of the month's total gross of all Class 1 railroads it seems fair to assume December will be the first month since February that gross exceeded that of the corresponding 1923 month.

Net operating income of these reporting roads totals $78,227,000 against $63,876,000 the preceding December, an increase of $14,351,000 or 22.4 per cent. In November they had $81,863,000 net. Assuming the balance of the roads still to report maintain about the same per cent of increase, it would result in a net of approximately $86,000,000, a new high record for December, and comparing with $69,694,000 in 1923.

Japan Orders Generators

The International General Electric Co. has received an order from the Hayakawa Electric Power Co., of Japan, for two 35,000 kilowatt turbo-generators and associated apparatus. The order involves about $900,000.

Inquiries and Orders from Railroads

The Chicago, Rock Island & Pacific is inquiring for 10 switching locomotives.

The New York Central is inquiring for 3 Pacific type locomotives for the Rutland R.R.

The Chicago, West Pullman & Southern has ordered one switching locomotive from the Baldwin Locomotive Works.

The Chesapeake & Ohio R.R. has given a contract to the American Locomotive Co. for building 48 locomotive boilers and fire boxes. This work is to be carried out at the Richmond, Va., plant of the locomotive company.

The Missouri Pacific R.R. is inquiring for repairs on 250 wooden box cars and 2,250 wooden gondola cars.

The Chicago, Rock Island & Pacific R.R. is inquiring for 1,200 box cars of 40 tons and 400 gondola cars of 50 tons' capacity.

Italy Buying More Machinery

Imports to Italy during the first 9 months of 1924 of the classification designated as tools and instruments used in agriculture and industry, amounted to 2,624 metric tons, as compared with 2,465 tons for the corresponding period of 1923, and 3,368 tons for the corresponding period of 1922, Trade Commissioner A. A. Osborn, Rome, reports to the Department of Commerce. The value of the imports for the 1924 period was greater than that for the corresponding period of either of the two preceding years.

Shipments from the United States during the 1924 period, 227 tons, show decided increases over the performances of the 1923 and 1922 period, but the imports from France show an even more striking increase. On the other hand, quantities imported from Germany have been steadily declining, but their values have fallen to a slighter extent, indicating the lessened ability of German exporters to lay down products at prices too low for other countries to meet.

Simplifying Hardware Items

Manufacturers of bright wire goods and cup and shoulder hooks, following in the steps of other branches of the hardware industry, have asked for the co-operation of the Division of Simplified Practice in action looking to the elimination of excessive varieties in their products. There has been appointed by the manufacturers a simplification group which is headed by R. D. H. Vroom of the H. L. Judd Co., New York City, and the secretary of which is Howard W. Nestor, of the Parker Wire Goods Co. of Worcester, Mass.

In co-operation with the American Hardware Manufacturers' Association, manufacturers of these products are studying their output to note the number of items that, in their judgment, can be eliminated.

The Business Barometer

This week's outlet in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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AT THE meeting of the National Boot and Shoe Manufacturers' Association in New York a few days ago the statement was authoritatively made that 14.2 per cent of the number of manufacturers in the industry operated 65.6 per cent of its total capacity and that they could produce 100 per cent of the present output of shoes. An excess capacity equivalent to roughly 50 per cent of the present production, which is about average, is indicated by the figures.

The automobile industry probably has a productive capacity of close to 5,500,000 vehicles, and sales this year are not likely to reach 4,000,000.

The steel industry operating at capacity would produce about 25 per cent in excess of our annual average consumption. The same is true in varying degree of our cotton and woolen mills, our woodworking plants, our tanneries, and most of our other manufacturing industries. The overmanning of the coal industry is notorious as the cause of its recurrent depressions and labor troubles. Many high cost copper mines are not operating "normally" even with the metal at 15 cents, and this is also true of our minor extractive industries.

These facts are not put forth as new or sensational, for it is wholly logical and desirable that there should be an ample margin of safety between our productive capacity and our average consumption plus exports. But it is nevertheless true that any business revival which includes the speeding up of this machine to above normal must prove fleeting unless prices are so low that distribution gains correspondingly, or unless buyers can be intoxicated by boom psychology or drugged by the anesthetic effect of easy money to the point of filling their shelves with merchandise they do not immediately need.

Neither of these essentials to a broad expansion are now present. Far from being low enough to encourage widespread increases in consumption, the average of prices is high and some commodities are "our of sight."

The boom virus which makes men buy recklessly in the fatuous expectation that prices will go ever higher has not infected them except in grains and stocks. Easy money has not been permitted to become an anesthetic despite our great accumulation of gold, for the financial powers have discovered means of reducing what the money writers call "the velocity of credit" and inflation has been mainly confined to some of the speculative markets into which the natural spillover of funds was diverted.

What's Doing in Industry

There was a noticeable lack of actual buying in the machinery and machine tool markets of the country during the past week, and no sales of importance were noted in any of the cities reporting. Inquiries were again plentiful and indications are for a good volume of business in February and March in most lines.

Railroad buying was reduced to necessities only, but Western roads seem to be coming into the market within the next sixty days for considerable amounts of new machine tools. The automobile makers were poor customers also, yet one hopeful sign was the fact that the automobile production during January was up to schedule in most cases and the Detroit men see no reason why February and March schedules should not be kept. This will mean increased machine tool buying by the automotive makers, the body builders and the accessory manufacturers. Makers of agricultural machinery are still buying tools according to Chicago and Milwaukee advices.

The matter of exporting has been given more attention since Jan. 1 and the prospects of sales through this channel are particularly bright. Japan is reported as being in the market again, South America has been buying continuously, and the markets in Europe are broadening. By March 1 the volume of export business should be increased and exporters able to more accurately forecast the future.

Hence the business revival which the stock market has been discounting has not yet arrived. In some industries distributors have shown a willingness to buy and operations have consequently been expanded, but the watchers are beginning to realize that if the rate of production is maintained or increased further shelves will soon be filled and the boom will be over.

In others operations are being carefully keyed to the present demand. Such industries are relatively quiet and unemployment among their workers is greater than is published or realized, as in some of the automobile centers. But these can at least look forward to steady business and the seasonal improvement that spring and better weather should bring, while the factories and mills that are now being speeded up are quieting down again.

According to the most authoritative reports from all sections the distributive trade of the country is only fair. This impression is confirmed by the latest figures available from the Federal Reserve Board, which show that in December wholesale trade was only a trifle broader than it was during the summer slump and that retail trade, while greater, showed less than the usual year-to-year increase.

These facts justify no great pessimism, for the total volume of wholesale and retail trade does not vary as much from year to year as many think, even in "silk shirt" years and the corresponding depressions. The plain truth is that the great American consumer generally has enough or can borrow enough to tide him over temporary misfortune and that he keeps on buying pretty steadily.

This trade is the "normal" to which primary production must quickly return when it departs either to rise above or fall below. The swings of business are being narrowed both by the great cushion of savings and charitable funds which absorbs its shocks and by the search for stability which has shown many executives that there is a constant they can tie to. They have found out that a degree of caution is rewarded and that even if great expectations are realized a reaction follows in their wake.

As to foreign trade, we are lending or taking to the rest of the world the money to pay for all it is buying from us and apparently that process will continue for some time. But that is one way of limiting inflation here. And as the sums due to this country increases, the capacity to take more goods from us is correspondingly diminished.

These are in brief my reasons for doubting that business will get very far above the normal line, or that it will stay above long if it does rise because so many people expect it to and act accordingly.

The statement of the Federal Reserve Banks last week was not particularly significant, but there was a further slight loss in note circulation and the reporting member banks on Jan. 31 disclosed a drop of $53,000,000 in their commercial loans. These changes are not indicative of business expansion.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

New York

February in the machinery and machine tool market of New York opens with promise. The many inquiries that were received during January by most dealers would presage good sales volume during February, and upon this the dealers base their hopes. While business was good during January, especially during the first three weeks, it was not up to expectations. General industrials and car builders were the best buyers with the railroads and automotive interests appearing only for necessities.

The last week found conditions somewhat better than the week previous. Sales were made to the New York Central R.R., the Pullman Co., the General Electric Co., the Baldwin Locomotive Works, and the Brady Brass Co. for its Jersey City plant. Inquiries were received from the Western Electric Co., the Baltimore & Ohio, the New York, New Haven & Hartford R.R., and the Pennsylvania R.R.

The used tool market has not found business as readily as during the last month of 1924. There are plenty of good machine tools available, but the market does not seem to be inclined toward reconditioned tools just now.

Cincinnati

Production in the machine tool plants of Cincinnati is going forward at a slightly increased rate as compared with the latter part of 1924. Some of the concerns state that business has not materialized as they had anticipated, but they believe that it is only a matter of time until good orders will be placed locally. It was thought by many executives that considerable buying would take place immediately after the first of the year, but the volume of purchase has been below expectations Inquiry among the large companies brings out the fact that present operations are slightly better than in December and the outlook is good. There is, however, stiff competition for all business and sales resistance on the part of prospective buyers is marked.

Railroad purchases have been negligible during the month of January. Manufacturers are optimistic about the future sales to transportation lines and they feel that much more buying will be done by the carriers during February. Several roads have lists out at present, but they have not placed their orders yet. It is thought that an improvement in railroad buying will be manifested shortly. Automobile manufacturers also have been cautious about purchasing tools. Business from this source has been quiet in the past month.

Production of lathes is fair at present with an increase recorded as compared with December. Milling machines have been ordered in fair numbers in the last few weeks. Several good orders for planers have been placed with local manufacturers in the past week. Woodworking machinery plants report that they are running on a satisfactory schedule. Electrical tool manufacturers state that business has recovered from the holiday quietness and production is fairly good with prospects encouraging for satisfactory sales in February.

Southern District

Though exceptionally bad weather prevailed a good part of January throughout the Southeast, machine tool and equipment sales continued active through the month, running with most of the dealers somewhat above the corresponding month of last year, in spite of the fact that early 1924 business was unusually good.

The heaviest sales during the month were to the railroad companies, with the textile industries showing quite a bit of improvement, and fair sales reported to the smaller machine shops and automotive service stations, though most of the latter business was in used or rebuilt equipment.

The lumber industries have been fairly active buyers, while road-building equipment sales are beginning to open up, inquiries from this source being in the heaviest volume in months and an excellent season in prospect. The road building program in the South this year, as announced by the highway departments of the various Southern states, shows that larger expenditures than ever are contemplated in 1925, which equipment dealers are confident will result in the best volume of business in these lines during the year that they have ever experienced in the South. Practically all states in the district have already started advertising for equipment bids, and some of these contracts for the early part of the year are now being placed.

The textile mill outlook also continues to show improvement, and there is promise of considerable activity here during the next few months, following a long period of dullness since last spring.

Dealers in rebuilt equipment also are looking for an active demand during the early part of the year from the automotive industry, as considerable construction by dealer firms and independent garage companies now in progress is certain to result in a brisk sale of tools used in service stations. An improved outlook for sales to smaller shops is also reported, but it is expected that a good part of this business will be in rebuilt machinery.

The steel industries in the Birmingham district have slowed up production a little during the past two or three weeks, but inquiries for heavier equipment from this source indicate that the dull period will only be of temporary duration.

Detroit

Actual orders of machine tools in Detroit so far during 1925 have not quite approached expectations in some quarters, but from inquiries being received there is evidence that sales volume will improve.

While chief attention has been paid the automobile plants in southeastern Michigan, much prominence is being given to the increased activity on the part of the railroads. The Grand Trunk R.R. this week placed an order for eight locomotives of superior type costing $720,000.

The Pere Marquette and Michigan Central are laying plans for extensions to their shops, while the other roads entering Detroit, as well as the terminal and belt line roads, are in the market for equipment.

Employment figures are the highest in this city since last May, and those versed in local conditions assert that they will gradually rise for the next two or three months.

Chicago

Developments in the Chicago machine tool industry, with January business over, have taken on no unexpected phase.

Inquiries have been sufficiently encouraging to warrant the prevailing feeling that the future will be active. Such orders as have materialized have mainly been for small lots, but a brisker business is counted on to create activity in the market within the next few weeks.

Machinery men this week are attending the automobile shows at the Coliseum and the Drake Hotel in large numbers. Every prominent automobile and motor truck maker in the United States is represented by an exhibit, either its principals or chief executives being present in person.

C. W. Nash, president of the Nash Motors Co. and the Ajax Motor Co., H. H. Bassett, president of the Buick Motor Co., Stewart McDonald, president of the Moon Motor Co., and John N. Willys, president of the Willys-Overland Co., with several others of equal prominence in the automobile industry, express themselves as decidedly optimistic regarding the outlook for increased demand and production. This will mean new machinery in many cases, and replacement of obsolescent

machine tools in others, but, either way, machinery manufacturers and dealers are bound to benefit. As indicating just what strides forward the automotive industry has taken during recent years, one instance, that of the Nash Motors Co., may be quoted. The first 12 months after this company was organized the total sales amounted to $16,761,794. The net sales for the eight years of its existence totalled $310,645,019, the business having increased on a steadily progressive scale. The automobile show this week, therefore, together with the optimism of exhibitors, has created an unquestionably cheerful spirit among machinery men, who believe that the automotive industry will prove to be a large factor in this year's sales.

Cleveland

If the number of inquiries that have developed for the first month of 1925 can mean anything, there is plenty of business in the offing for the machine tool trade of the Cleveland district. This is the opinion of leaders in the trade here following a survey of the prospects that have developed in the last four weeks. Concerning actual business done in the month just closed, not so much of encouragement can be offered, for orders in most branches of the industry have been fewer than was expected with the turn into the new year.

One of the exceptions, however, is in the automatic field. From reports received by leaders in this branch of the trade, it would seem that light manufacturing is going ahead with a good deal of speed. Business in this class of equipment is being closed largely with interests affiliated with the automotive industry, and probably will continue to improve.

In the planer and allied fields prospects are equally good, though these prospects, to date, have not been backed by actual orders. Some of the most encouraging phases, however, are supplied in the number of inquiries received from manufacturing interests in both Eastern and central Western states for equipment that will meet heavy duty requirements. In line with this are inquiries from lumber, textile and other industries which assert they will require equipment of this character with which to rebuild and repair their own machines. Likewise there are inquiries from school boards which indicate a disposition to install equipment for manual training and for general repair purposes.

In other departments the outlook is encouraging, though there is not much upon which to base this encouragement. An illustration is supplied in the shear and punch fields. Here much was expected at this time from the steel fabrication manufacturers, but these report they are held back by the prolonged cold weather that is interfering with building operations, particularly in the central West and East, with little prospect of immediate abatement.

During the last fortnight a resumption of the jobbing work by many machine tool manufacturers is noted in the Cleveland district. There has been a suspension of this with the turn of the year. Now manufacturers find they have more work than they can care for, but not enough in sight to warrant tool replacement or plant expansion. They are accordingly awarding a goodly percentage of their contracts to tool manufacturers, and in some instances the latter are working nights to turn these orders out on time.

Indianapolis

Business, both in tools and metal working machinery, appears to be expanding slightly in the Indianapolis district. Inventories virtually are completed and production is being resumed in many lines. Up to the present time much of the activity in the trade has centered in a large and diversified volume of inquiries.

Local tool men say the railroads are showing considerably more activity than they did during the last of 1924. A large volume of motive power and rolling stock is being repaired and were it not for the fact that most of this stock is needed and only emergency repairs are being made, the volume would be much larger.

Many railroad machine shops, that were closed last summer and early fall, have been re-opened and this has directly affected the tool trade. Some special machinery is being purchased by the railroads, but the volume thus far this year has been small.

The automobile business is very quiet.

Manufacturers of electric machinery may expect a good year in Indiana if all advance plans for replacements and new construction materialize. Already inquiries are being made for this class of machinery.

Demand for coal mining machinery has slumped off following a fair fall and early winter business. The mines in Indiana are not working satisfactorily and operators are spending as little as possible on repair work. No new shafts are being sunk at the present time.

New England

Among production superintendents in the New England territory, two outstanding facts were commented upon at interviews in scattered points. These were the improvement in production by employees, and the purpose of avoiding overproduction. The lesson of a year ago—when, during the first quarter, there was a heavy volume of manufacturing in anticipation of increased business that failed to materialize—has been well learned. The policy in these quarters will be to keep production down to a small percentage in excess of immediate deliveries.

In New Britain, Waterbury and Worcester, a scanning of tax lists shows manufacturers with greatly depleted inventories for finished and raw material on hand. There is no intention to stock heavily now, either with raw material, or with finished machines for quick delivery.

Observations, backed by records, show that the labor production is of a better order. Employees are now giving more and better workmanship. This is especially true in those places where operations have been on curtailed schedules.

Again reports from sales managers indicate that buying for the week has been largely for export delivery. The buying was principally for continental countries.

Machinery builders, particularly those manufacturing specialties, are most optimistic and statements were made of business already on the book to carry operations along at capacity for three to five months and business in prospect that will call for steady operations much longer and probably overtime work.

Philadelphia

Some of the larger machine tool plants in Philadelphia are operating at about 60 per cent of their full capacity, and are looking forward to a continued activity during most of the year. This hope for better business is based upon what appears to be highly satisfactory underlying economic conditions, which appear to be steadily improving.

All of the dealers realize that the present situation brings an application of the rule that the machinery and machine tool industry is the last to feel an increase in the volume of business when an era of prosperity comes to other lines. This seems to account for the failure of many concerns to receive any considerable number of inquiries from prospective buyers.

Bankers and business men generally reporting their analysis of the present situation here show that in December there was a gain of 15 per cent in wholesale business and a 4 per cent gain in retail transactions. This is an increase considerably larger than had been anticipated and is hailed as a hopeful sign.

Dealers in used machinery believe the present situation presents a hopeful outlook, based upon some inquiries that have come in recent weeks for various sorts of equipment. Many of the larger purchasers of machinery have hesitated to make up a list of requirements until the increased activity gets into a fuller swing.

February and March should both be good months from the dealer's standpoint.

Electric Trucks Gain in Popularity

Briefly summarized the results achieved by the electric truck industry during the past year show progress. Most manufacturers enjoyed a satisfactory volume of sales, some manufacturers exceeding all previous records. New York was again the most active market with a total sales of 540 new trucks, an increase of 8 per cent in this territory, while sales in Manhattan and the Bronx, not including Brooklyn and adjacent territory increased 19 per cent and new users increased 20 per cent over 1923. Sales were not confined to New York, however, as new trucks were sold in 22 states from New Hampshire to California.

Sales were made to 14 different electric light and power companies during the year and sales to two additional such companies were made immediately after the beginning of the new year. Another result is the number of fleet orders closed during 1924.

Engineering Council Approves Changes in Reorganization Bill

Dean Kimball elected a vice-president representing A. S. M. E.

Changes in the Government Reorganization bill as it affects the Department of the Interior were sanctioned by the Assembly of the American Engineering Council in Washington, Jan. 16. After a long discussion, it was decided to join with other national bodies in seeking amendments to the existing bills in House and Senate, $1,000 being voted toward a fund of $5,000 for this purpose.

Adopting the report of its committee on Government Reorganization as it relates to engineering matters, the Council in a formal resolution declared that the proposed legislation should be amended so as to bring it into substantial accord with the principles embodied in the Jones-Reavis bill originally sponsored by the engineering profession through the National Public Works Department Association of Washington.

To shape in every state a constructive policy in harmony with Federal action, the Council will enlist national and local engineering societies in a countrywide study of reforestation in the United States and Canada.

Over the protest of the Detroit Engineering Society, which declared, "the basic doctrine of unionism is unsound and not in harmony with American ideals," the Administrative Board voted to continue the Council's active participation in the National Board for Jurisdictional Awards in the Building Industry. The action of the Board is upheld by the Assembly.

A special committee of the Council, headed by W. E. Bryan, of the Associated Engineering Societies of St. Louis, submitted a report of an exhaustive study of the workings of the jurisdictional board during the past twelve months.

These two vice-presidents were elected: A. W. Berresford of Niagara Falls, N. Y., representing the American Institute of Electrical Engineers; Dean Dexter S. Kimball of Cornell University, designated by the American Society of Mechanical Engineers. Harrison E. Howe of Washington, D. C., was re-elected treasurer, and Lawrence W. Wallace was again chosen executive secretary. The next meeting of the Council will be held in Philadelphia in May.

The Engineers Club of Little Rock, Arkansas, was admitted to membership. Other local societies, it was said, are likely to be enrolled in the Council during 1925.

Hudson Motor Co. Lives Up to Schedule

January production of the Hudson Motor Car Co. will equal the schedule of 17,600 Hudson and Essex cars planned at the beginning of the year. Net earnings for the month are estimated in excess of $1,000,000. For the fiscal year ended Nov. 30, 1924, Hudson earned $8,073,459, equal to $6.11 a share on 1,320,050 shares of no par value capital stock.

Present demand indicates that February production schedule at 18,700 cars and March at 20,400 will be filled.

Census of Railroad Repair Shops

The Department of Commerce announces that, according to the data collected at the biennial census of manufactures, 1923, the repair shops of steam- and electric-railroad companies reported work done during that year to the aggregate value of $1,520,092,751, an increase of 19.9 per cent as compared with 1921, the last preceding census year. For steam-railroad repair shops alone the total was $1,433,680,106, an increase of 21.5 per cent as compared with 1921, and for electric-railroad repair shops it was $86,412,645, a decrease of approximately one per cent.

The amount paid for contract work done in 1923 was $14,813,084 (exclusive of contract work to the value of $6,354,422 performed by contractors in steam-railroad repair shops), an increase of 792 per cent as compared with $1,660,668 in 1921. Practically all this contract work was done for steam-railroad repair shops.

Of the 2,352 establishments reporting for 1923, 232 were located in Pennsylvania, 182 in Ohio, 181 in New York, 177 in Illinois, 117 in Texas, 110 in Indiana, 81 each in Iowa and Minnesota, and 75 in Wisconsin, and 1,116 were distributed throughout the remaining 39 States and the District of Columbia.

Newfoundland Machinery Sales Increased

Exports of industrial machinery from the United States to Newfoundland increased over 300 per cent in 1923 over the preceding year, according to *Commerce Reports* published by the Department of Commerce. The leading factor in this increase was a gain of over $180,000 in exports of construction and conveying machinery during 1923. United States customs' figures for the first nine months of 1924 show a decided decline in exports of this equipment, in comparison with corresponding months in 1923, but an increase in shipments of practically all other items in the industrial machinery classification. Total industrial machinery exports from the United States to Newfoundland gained approximately 25 per cent during the first nine months of 1924 over a corresponding period in 1923.

This Northern country is advancing with great rapidity and is being encouraged by many of the big Canadian interests in Montreal and Toronto.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Four spindle vertical drilling machine, screw machines, oscillating tool grinding machines including all equipment. Melbourne, Australia. Purchase. Reference No. 13,184.

Drilling and pressing machines, all types, boring mills, and grinding and broaching machines. Paris, France. Agency. Reference No. 13,164.

Engineering goods and machinery. Bandoeng, Java. Agency. Reference No. 13,149.

Engines and machinery in general. Buenos Aires, Argentina. Agency. Reference No. 13,174.

Machine tools. Milan, Italy. Agency. Reference No. 13,146.

Machine tools. Paris, France. Agency. Reference No. 13,161.

Machine tools. Neuilly, France. Agency. Reference No. 13,163.

Machine tools. Tokyo, Japan. Purchase. Reference No. 13,176.

Machine tools for repair shops. Goteborg, Sweden. Agency. Reference No. 13,212.

Metal working and wood working machinery and small tools. Lille, France. Agency. Reference No. 13,162.

Electric hoists. Toronto, Canada. Agency Reference No. 13,290.

Turret and precision lathes. Vienna, Austria. Purchase. Reference No. 13,296.

Turret lathes for turning transmission shafts. Bordeaux, France. Purchase. Reference No. 13,267.

Machinery. Shanghai, China. Agency. Reference No. 13,322.

Machinery for making cars. Arendel, Norway. Purchase. Reference No. 13,326.

Machinery and factory equipment and supplies. Paris, France. Agency. Reference No. 13,261.

Machine tools for manufacturing plants. Paris, France. Agency. Reference No. 13,330.

Machine tools. The Hague, Netherlands. Agency. Reference No. 13,264.

Metal working and wood working machines. Toulouse, France. Agency. Reference No. 13,325.

Wood working and saw mill machinery. Munich, Germany. Agency. Reference No. 13,338.

Reamers, adjustable, taps and dies, twist drills, and amaril and carborundum disks. The Hague, Netherlands. Agency. Reference No. 13,264.

Mechanics' tools and hand tools. Rio de Janeiro. Agency. Reference No. 13,293.

Forthcoming Meetings

Southern Supply & Machinery Dealers' Association and the American Supply & Machinery Manufacturers Association. Joint Convention. The Atlanta-Biltmore Hotel, Atlanta, Ga., May 5, 6 and 7. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

The Society of Industrial Engineers. National Convention. Hotel Winton, Cleveland, Ohio, May 6, 7 and 8. Executive secretary, George C. Dent, 608 S. Dearborn St., Chicago, Ill.

American Society of Mechanical Engineers. Spring Meeting. Milwaukee, Wis. May 18, 19, 20 and 21. Calvin W. Rice, secretary, 29 West 39th St., New York City.

Society of Automotive Engineers. Summer Meeting. Greenbrier Hotel, White Sulphur Springs, W. Va., June 16, 17, 18 and 19 C. F. Clarkson, secretary, 29 West 39th St., New York City.

American Society for Testing Materials. Twenty-eighth annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 22, 23, 24, 25 and 26. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

National Foreign Trade Council. Annual Convention. Seattle, Wash., June 24, 25 and 26. O. K. Davis, secretary, India House, Hanover Square, New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Demand is especially active for charcoal pig iron. Small tonnage lots of No. 2 fdry. iron, for prompt delivery, are being taken at $20 to $20.50 per ton; second quarter iron is 50c. to $1 higher. Black and galvanized steel sheets are up 15c. per 100 lb. at New York warehouses, following recent rise of $2 per ton at mills. Similar mill advance occurred in wire products. Shapes are still $2@$2.10 per 100 lb., Pittsburgh, with bars at $2.10@$2.20 and plates, $2@$2.20 per 100 lb.

Non-Ferrous Metals—Upward trend in copper prices; inquiries active; rise of ¼c. per lb. in New York warehouses since Jan. 23. Tin firm at present level. Lead market weak; zinc prices stable; both unchanged in past week. Antimony up ¾c. per lb.

(All prices as of Jan. 30)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.05
Northern Basic	23.77
Southern Ohio No. 2	23.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	30.25
BIRMINGHAM	
No. 2 Foundry	20.00@20.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	24.76
Virginia No. 2	30.17
Basic	24.76
Grey Forge	23.75
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.55
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	23.77
Basic	23.77
Bessemer	23.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.70	3.89	3.45	3.80
No. 12	2.80	3.94	3.50	3.85
No. 14	2.90	3.99	3.55	3.95
No. 16	3.10	4.09	3.65	4.15
Black				
Nos. 17 and 21	3.45	4.55	4.15	4.30
Nos. 22 and 24	3.50	4.60	4.20	4.35
Nos. 25 and 26	3.55	4.65	4.25	4.40
No. 28	3.60	4.75	4.35	4.50
Galvanized				
Nos. 10 and 11	3.75	4.75	....	4.50
Nos. 12 and 14	3.85	4.85	....	4.60
Nos. 16	4.00	5.00	....	....
Nos. 17 and 21	4.15	5.15	....	4.90
Nos. 22 and 24	4.30	5.30	3.00	5.05
No. 26	4.45	5.45	4.15	5.20
No. 28	4.75	5.75	5.45	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	59½%	48%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	56½%	45%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 36% off.

Size, Inches	List Price per Foot	Diameters Inches — External	Diameters Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.85	8.00	7.20
Hoop steel	4.49	4.35	4.15
Cold rolled strip steel	7.00	8.25	7.85
Floor plates	5.55	4.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.42½	3.10
Bar iron (3.00@3.10 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb. Chicago, 3/32, 8.85c.; ⅛, 7¾c.; ¼, 7.95c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			58.00
Lead (up to carlots), St. Louis	9.75	New York	10.50
Zinc (up to carlots), St. Louis	7.65	New York	8.37½

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	19.00	20.00	16.25
Copper sheets, base	23.00	23.25	22.12½
Copper wire, base	20.62½	21.87½	20.75
Copper bars, base	22.25	23.75	22.62½
Copper tubing, base	25.25	25.87½	25.75
Brass sheets, base	19.62½	20.25	19.25
Brass tubing, base	24.25	26.00	25.00
Brass rods, base	17.62½	19.37½	18.37½
Brass wire, base	20.12½	21.25	20.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1–15 ton lots	27.20	28.00	27.00
Zinc sheets (casks)	12.00	12.25	11.37
Solder (½ and ½), (case lots)	42.00	37.50	....
Babbitt metal (83% tin)	60.00	68.50	50.00
Babbitt metal (35% tin)	28.00	21.50	28.00
Nickel (ingots) f.o.b. refinery	29.00	....	....
Nickel (electrolytic) f.o.b. refinery	33.00	....	....
Nickel (F shot) f.o.b. refinery	30.00	....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.75@13.00	12.75	12.00
Copper, heavy, and wire	12.50@12.75	12.50	11.50@11.75
Copper, light, and bottoms	10.75@11.00	11.00	10 50
Heavy lead	8.00@ 8.25	8.00	8 00
Tea lead	7.00@ 7.25	6.50	6.75
Brass, heavy, yellow	7.75@ 8.00	8.00	8.00@8.25
Brass, heavy, red	9.75@10.00	10.00	9.75
Brass, light	6.50@ 6.75	7.00	6.75
No. 1 yellow rod turnings	8.25@ 8.50	8.00	8.00
Zinc	4.50@ 4.75	4.00	5.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$22.85	$21.00
"A" Grade:				
IC,	20x28, 112 sheets	19.00	18.80	17 00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	13.00	13.50	13.00
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.80@6.90	6.75

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.14@0.16
Cotton waste, colored, per lb.	.10@ .15½	.18	.09½@.12¾
Wiping cloths, 13½x13½, per lb	12.00*	36.00 per M	.11
Wiping cloths, 13½x20½, per lb.	..	50.00 per M	.11
Sal soda, per 100 lb. keg	2.25	2.25	2.25
Roll sulphur, per 100 lb. keg	3.60	3.25	3.75
Linseed oil, per gal., 5 bbl. lots	1.18	1.33	1.25
Lard cutting oil, 25% lard, per gal.	.60	.50	.32
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.21
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	40–2½%
Heavy grade	30–5%	30%	38–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	60%
Second grade	50–10%	60–5%	65%

*White, at washery.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0354
Cold finished shafting	per lb.	.0415	.0415	.044
Brass rods	per lb	.1762½	.1687½	.15
Solder (½ and ½)	per lb.	.42	.40@.41	.3475
Cotton waste	per lb.	.15@.22	.14@.21	14@21
Washers, east iron (¼ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	60	.55	.55
Machine oil	per gal.	.29	.29	.29
Belting, leather, medium	off list	40–2½%	40–2½%	40–2½%
Machine bolts up to 1x30 in.	off list	45%	45%	45%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	....
Emery paper	10.71	11.00	$11.90
Emery cloth	28.00	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.65
Cloth	3.38	2.67	3.55
Fire clay, per 100 lb. bag	....	.65	.75
Coke, prompt furnace, Connellsville	per net ton		3.75@4.00
Coke, prompt foundry, Connellsville	per net ton		5.00@5.75
White lead, dry or in oil	100 lb. kegs	New York, 16.75	
Red lead, dry	100 lb. kegs	New York, 16.75	
Red lead, in oil	100 lb. kegs	New York, 18.25	

SHOP SUPPLIES

	New York	Cleveland	Chicago
Rivets: Button heads, ½-in., ¾-in., 1x2-in. to 5-in., per 100 lb.	$3.75	$3.50	$3.50
Cone heads, ditto	3.85	3.60	3.70
Washers, cast iron: ½-in. per 100 lb.	6.50*	4.00	3.75
¾-in., per 100 lb.	5.50*	4.00	3.75

Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.50 per 100 lb. at Cleveland. Tap bolts with hex. heads are $4.65 per 100 lb. at Chicago.

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 45%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 35%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 40%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 35%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 45%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35%.

Bolt ends, 1x12-in., 10c. per lb., less 45%.

Nuts, semi-finished, ¼x½-in., 2c. each. Discount 70% for $\frac{5}{16}$-in. and smaller and 65% for ⅜-in. and larger.
Case hardened ¼x½-in., 6c. each, less 50%.

Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 60%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅜-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Calif., Bishop—Bishop Union High School Dist., C. G. Leichman, Clk.—patternmakers lathes, two, 6 ft. bed and 14 in. swing; one, 8 ft. bed, and 16 in swing.

Conn., New Haven—Dept. of Education, City Hall, 169 Church St.—manual training equipment including lathes, etc., for shop practice, for Carlisle St. school.

D. C., Washington—A. L. Flint, Gen. Pur. Officer of the Panama Canal will receive bids until February 13th, for miscellaneous hand tools, including combination punch and shears (circ. 2373).

Ill., Moline — Deere and Co. — slitting shears, 48 in. knives for $\frac{7}{16}$ in. stock.

N. Y., New York—Anaconda Copper Mining Co., 25 Broadway—lever shears for $\frac{1}{2}$ in. x 5 in. flats.

Ill., Rockford—Elco Tool and Screw Co., H. O. Swanson, Secy.—equipment for new factory.

Md., Baltimore—Wm. Suchting & Sons, 604-18 Lexington St.—machinery for the manufacture of wood boxes.

Mass., Boston — Boston Envelope Co., 1000 Washington St., 15 in. shaper, swivel head and vise.

Mass., Boston—R. M. Dobbins, 209 Washington St.—miscellaneous equipment for 7 story garage on Bowdoin St.

Mass., Boston—State St. Garage, Inc., c/o S. S. Eisenberg, 46 Cornhill—machinery and equipment for 6 story garage.

Mass., Brookline (Boston P. O.)—G. W. Bunnell, 56 Winchester St.—miscellaneous tools and equipment for repair and service garage on Newbury St.

Mass., Lynn—M. Levin, 204 Summer St.—equipment and tools for garage and repair shop, on Blossom and Wheeler Sts.

Mass., Newton—City, c/o H. Fitts, Chn. Building Comn., City Hall — metal and woodworking machinery and equipment for manual training department of a new high school.

Minn., Ely—E. L. Rautio—reconditioned tinner's brake.

Mo., North Kansas — Standard Steel Works—pipe threading and cutting machine, for pipe $\frac{1}{8}$ in. to 4 in. (used).

Mo., St. Louis—The St. Louis and San Francisco Railroad, Frisco Bldg., Ninth and Olive Sts., B. T. Wood, V.-Pres. and Pur. Agt., plans to expend $107,000 for machinery and shop equipment, part of 1925 improvement program. F. G. Jonah, Ch. Engr.

N. Y., Bolivar—MacDonnell & Brannen Corp.—equipment, including lathe, drill, grinders, etc., for branch machine shop at Eldred, Pa.

N. Y., New York—New York Machinery Co., 200 Fifth Ave., three, 42 in. die presses; two, Black & Decker electric drills.

N. Y., New York—Novo Tool Corporation, 758 Whitlock Ave.—grinder.

N. Y., Niagara Falls—The Carborundum Co.—hydraulic press, 16 in. ram, 36 in. platens, stroke up to 16 in., for 5,000 lbs. hydraulic pressure.

N. Y., Rochester—North East Electric Co., A. M. Anderson, Pur. Agt.—one 3-2 spindle Avey drill press (used).

Pa., Christiana—Christiana Machine Co.—molding machines, 1 electric traveling crane, 10 ton a.c. motors, 45 ft. span, 3 phase 60 cycle, 200 v. (used).

Pa., Pittsburgh—Diamond Alkali Tire Co., First National Bank Bldg., Pittsburgh, Pa.—overhead crane for plant at Painesville.

Pa., Reading—The Reading Sheet Metal Products Co., Inc.—Ferrocut Machine Co. press, P. 24 or P. 23.

Tenn., Kingsport—The Bd. of Education, c/o Ross N. Robinson, Supt.—manual training equipment for proposed new high school.

Wis., Kimberly—School District 3, M. H. Kettenhofen, Dir., will receive bids until March 3, for manual training equipment including woodworking machines, woodturning lathes, band saw, etc.

Wis., Milwaukee—Globe Electric Co., 14 Keefe Ave.—complete wood working machinery for shop.

Wis., Milwaukee—New Era Manufacturing Co., 851 Kinnickinnic Ave., J. Drahonowsky, Pres. (carburator manufacturers)—2 punch presses, one 3 in. to 3½ in. stroke, the other somewhat smaller, also 14 in. to 16 in. toolroom lathe.

Wis., Milwaukee — Wrought Washer Manufacturing Co., 46 So. Bay St.—slitting shear to handle ¼ in. stock, up to 24 in. wide.

Wis., Racine—A. C. Gales, 1638 Villa St.—additional machine tools, for machine shop.

Wis., South Milwaukee — Bettinger & Stratton, monorail crane.

Ont., Delphi—Allan A. Crozier—complete equipment for wagon works, blacksmith and general repair shop, to replace fire loss. Estimated total cost $10,000.

Ont., Dromore—Robert Renurck—equipment for saw mill.

Ont., Guelph — Page Hersey Iron and Tube Co.—complete equipment for galvanizing plant, recently destroyed by fire, loss $15,000.

Ont., Kincardine—Averys Garage & Auto Repair Shop—complete equipment to replace fire loss.

Ont., Toronto — Albert Coomb, 1057 Woodbine St.—woodworking equipment, including saw, planer, tenon machine, mortiser, motors, etc., for sash and door factory, to replace fire loss.

Opportunities for Future Business

Calif., Los Angeles—Coco Cola Bottling & Distributing Co., 1334 So. Central Ave., awarded contract for the construction of a 2 story (eventually 4) garage and loft building, on Birch and 14th St. Estimated cost $150,000. Noted Jan. 29.

Calif., San Francisco — Globe Electric Works, 1959 Mission St., awarded contract for the construction of a 2 story factory building at Mission and 15th Sts. Cost $47,000.

Ill., Rockford—Elco Tool & Screw Corporation is building a 2 story, 60 x 190 ft. factory. Estimated cost $25,000. H. O. Swanson, Secy.

Kan., Chanute—Bd. of Education plans an election February 10th, to vote $350,000, for improvements in junior and senior high schools, including manual training shops.

La., Iberville—W. B. Spencer, 321 St. Charles St., E. M. Loeb, 618 Magazine St., R. E. Loeb, Hiberian Bldg., New Orleans, plan the construction of a six story garage building on Royal and Bourbon Sts. Estimated cost $400,000. W. H. Williams Co., Inc., 814 Howard St., New Orleans, Archts.

La., New Orleans—C. S. Williams, c/o Favrot & Livaudais, Hibernia Bank Bldg., Archts., will soon award contract for the construction of a 5 story, ramp type, garage, at Gravier and Poydras Sts.

Md., Baltimore—Wm. Suchting & Sons, 604-18 Portland St., will soon award contract for a 3 story factory building for the manufacture of wood boxes. Estimated cost $45,000. S. T. Williams, 8 East Lexington St., Archt.

Mass., Boston — H. I. Shackley, 582 Massachusetts Ave., will soon receive bids for the construction of a 4 story, 70,000 sq. ft. public garage, 18-20 Deerfield St. Estimated cost $250,000. Mulhall & Holmes, 33 Newbury St., Archts. Noted Jan. 29.

Mass., New Bedford—City, Fire Dept., awarded contract for the construction of a 1 story addition to machine and repair shop.

Mass., Norfolk Downs (Boston P. O.)—S. H. Couch Co., Inc., 170 Purchase St., Boston, manufacturer of telephones, is having preliminary plans prepared for the construction of a 1 and 2 story mill addition here. Estimated cost $40,000. Franch & Hubbard, 210 South St., Boston, Archts.

Mass., Roxbury (Boston P. O.)—Mechanics Iron Foundry Co., 38 Kemble St., is having plans prepared for the construction of a 1 story, 105 x 150 ft. foundry, here. Estimated cost $75,000. H. E. Gibby, Treas. E. W. Lawson, 6 Beacon St., Boston, Archt.

Mass., South Boston (Boston P. O.)—W. H. Fields Co., 39 Washington St., North, awarded contract for the construction of a 1 story, 20 x 60 ft. machine shop addition, to plant here. Monks and Johnson, 99 Chauncy St., Boston, Archts.

Mo., St. Louis—Brocksmith Manufacturing Co., 1860 Menard St., awarded contract for the construction of a 1 story, 52 x 129 ft. factory, on 2118-20 South Seventh St., for the manufacture of auto accessories.

O., Cleveland—The McKinney Steel Co., J. E. Ferris, V. Pres., Perry Payne Bldg., awarded contract for the construction of one, 40 in. blooming mill; one 2 in. billet, and 18 in. sheet bar mill, on the Cuyahoga River. Estimated cost $1,000,000. Private plans.

O., Cleveland—Sands Manufacturing Co., 5407 Sweeney Ave., awarded contract for the construction of a 2 story, 90 x 108 ft. factory building, on East 55th St., for the manufacture of water heaters. Estimated cost $25,000. Private plans. L. Sands, Pres.

O., Norwalk—Bostwick & Goodell, J. W. Goodell, Pres., manufacturers of metal screens, awarded contract for the construction of a 1 story, 85 x 300 ft. factory. Estimated cost $100,000. Private plans.

Pa., Allenport—Pittsburgh Steel Products Co., Union Trust Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story, 140 x 900 ft., steel products plant. Estimated cost $1,500,000. Private plans.

Pa., Philadelphia — Feigenbaum, c/o C. G. Gerber, First National Bank, Engr., plans the construction of 6 story, 36 x 100 ft. garage on 4th Ave., Estimated cost $200,000.

Tenn., Chattanooga — Somerville Iron Works plans the construction of an addition to foundry and shops, here. Estimated cost $150,000.

Wash., Hoquiam—The Harbor Plywood Company, plans the construction of a fir veneer plant, with daily output, 55,000 sq. ft. of panels. Estimated cost $325,000.

Wis., Milwaukee — Globe Electric Co. 14 Keefe Ave., awarded contract for the construction of a 4 story, 32 x 100 ft. woodworking shop and office, on Keefe Ave.

Wis., Racine—A. C. Gales, 1638 Villa St., plans the construction of a 2 story, 40 x 80 ft. machine shop, on Owen Ave. Estimated cost $25,000. A. L. Flegel, Baker Bldg., Archt.

Ont., Toronto — A. Coomb, 1057 Woodbine St., plans to rebuild sash and door factory, which was recently destroyed by fire here.